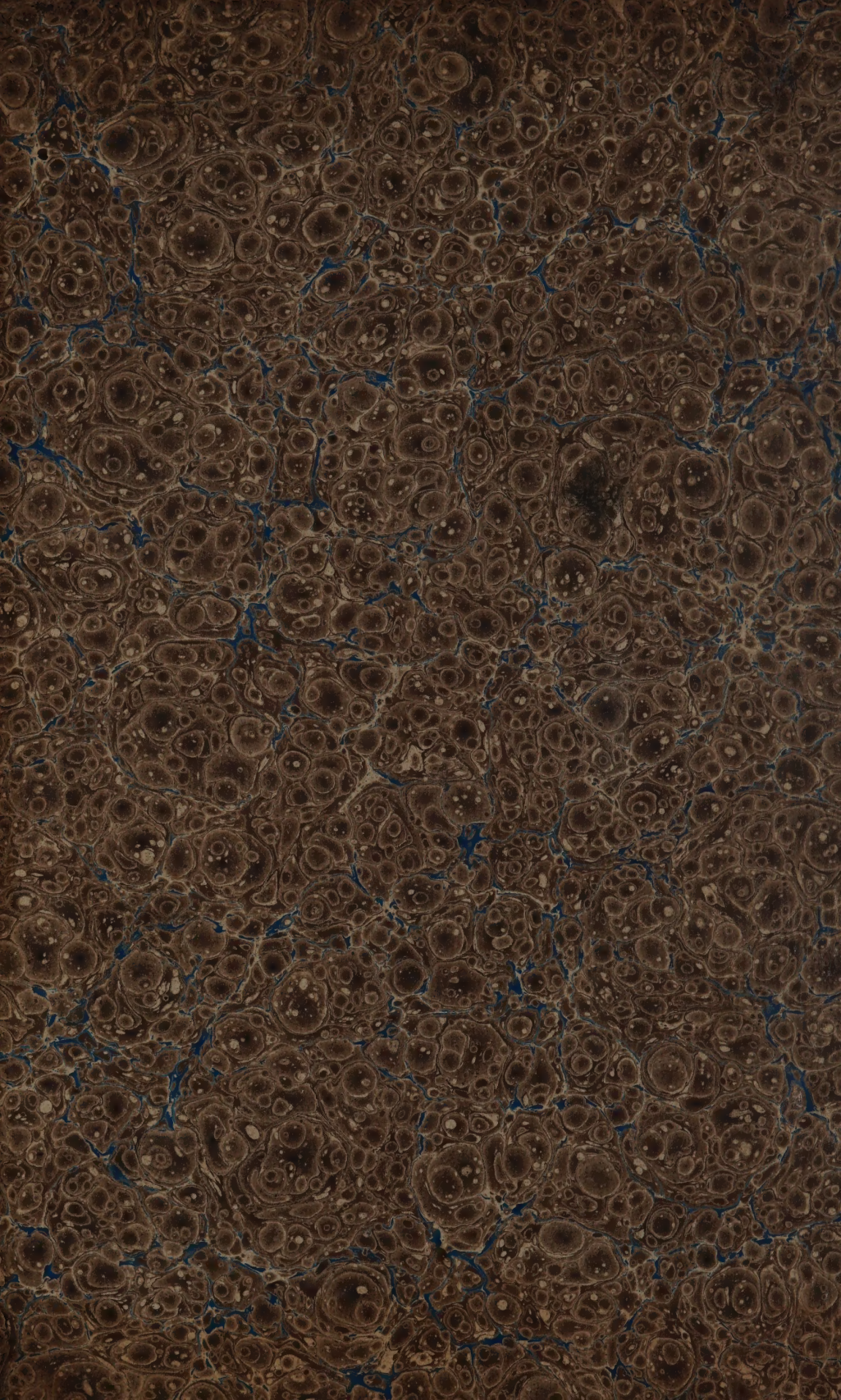
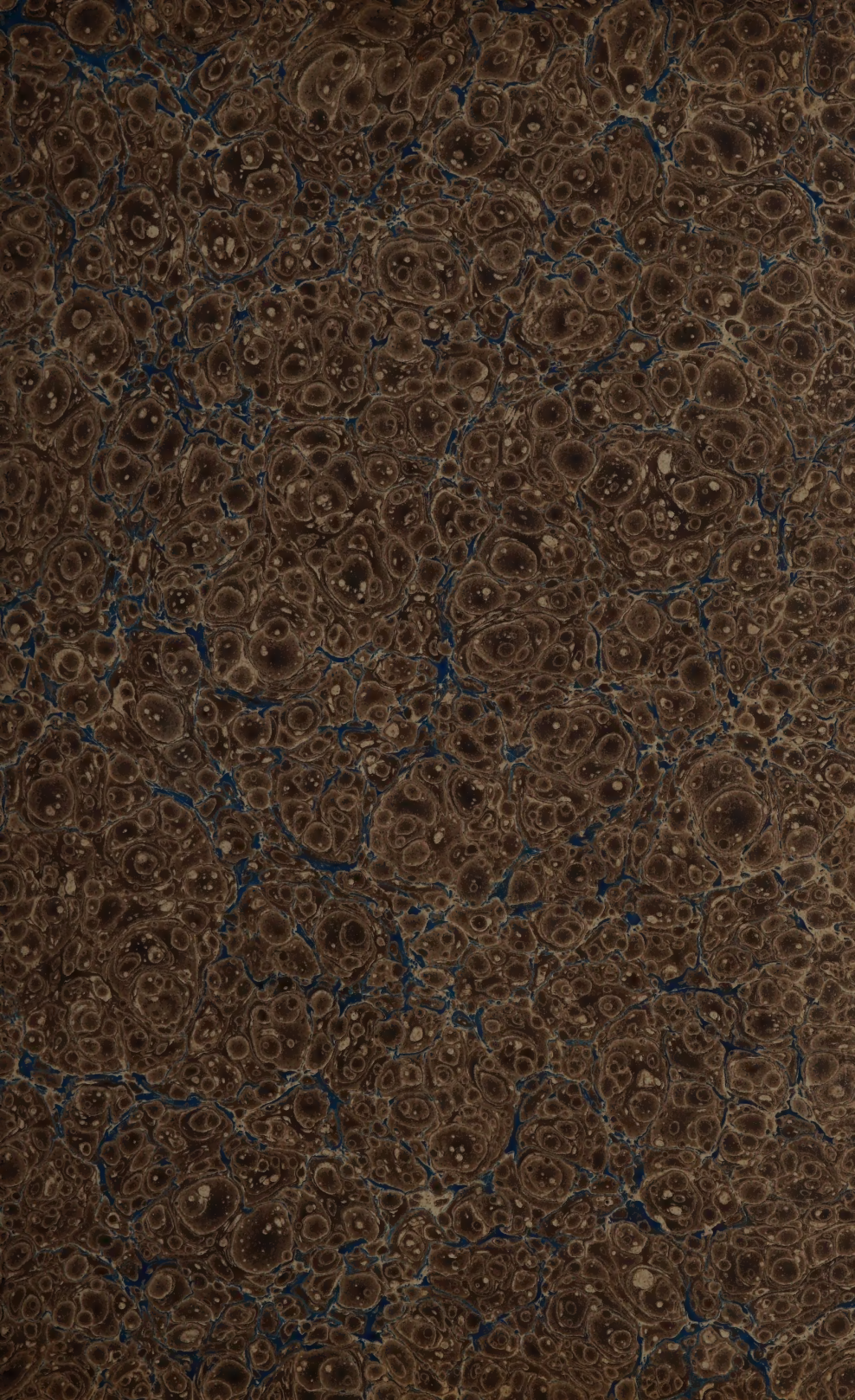






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PANTOLOGIA.

VOL. IX.

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PANTOLOGIA.

A

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MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY, AND OF THE LINNEAN SOCIETY OF
PHILADELPHIA;

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PHILOSOPHICAL SOCIETY, NEWCASTLE-UPON-TYNE; AND

MR. NEWTON BOSWORTH,

OF CAMBRIDGE;

ASSISTED BY OTHER GENTLEMEN OF EMINENCE, IN DIFFERENT
DEPARTMENTS OF LITERATURE.

VOL. IX.

P — PYZ.

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1813.

PANTOLOGIA.

P

P A labial consonant, formed by a slight compression of the anterior part of the lips, and retaining an uniform sound, and the fifteenth letter in the English alphabet.

When the P is followed with an H in the same word, it has the sound of an F; thus, *philosophy* is pronounced *filosophy*: and this is generally the case in words derived from the Greek.

P and B are so like each other, that Quintilian declares, that in the word *obtineuit*, his reason required him to put a *b*, but that his ears could hear nothing but a *p*, *optineuit*: hence in ancient inscriptions, and old glossaries, it appears, that these two letters have often been confounded.

Several nations still pronounce one for the other, the Welch and Germans particularly, who say, *ponum vinum*, for *bonum vinum*.

Plutarch observes, it was usual for those of Delphi to say *βουλει* for *παιλει*, *βουρρυ* for *πυρρυ*; and among the Latins, as often as an *s* followed, the *b* was changed into as *p*, as *scribo*, *scripsi*.

P is sometimes mute before *i*, as, *accompit*; but in modern orthography it is usually omitted.

P, in the Italian music, frequently represents *piano*; which is what in our music we call soft, i. e. the force of voice or instrument is to be diminished, so as to make a kind of echo.

PP signifies *piu piano*, i. e. more soft, or a second echo weaker, or more remote than the former: and PPP signifies *pianissimo*, softest of all, or a third echo, the voice being as it were lost in the air.

P. M. among astronomers, is frequently used for *post meridiem*, or afternoon; and sometimes for *post mane*, after the morning, i. e. after midnight.

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P A B

P was also used among the ancients as a numeral letter, signifying the same with the G, viz. a hundred; according to the verse of Ugutio.

P similem cum G numerum monstratur habere, Though Baronius thinks it rather stood for seven.

When a dash was added a-top of *P*, it stood for four hundred thousand.

St. Jerome observes on Daniel, that the Hebrews had no P; but that the *ph* served them instead thereof; adding, that there is but one word in the whole Bible read with a P, viz. *apadno*.

The Greek π signified 80. The Latins used P as an abbreviation. Thus P stood for Publius, pondo. &c. In S. P. Q. R. or Senatus populusque Romanus, for populus; R. P. denoted *res publica*; P. C. *patres conscripti*; PR. S. *prætoris sententia*, &c. On the French coins, P denotes those that were struck at Dijon.

P, in medicinal prescription, is used for *pugil*, or the eighth part of a handful.

P. Æ. signifies *partes æquales*, equal parts of any ingredients: otherwise denoted by *a* or *ana*.

P. P. signifies *pulvis patrum*, i. e. Jesuit's powder, or the cortex Peruvianus in powder; which is so called, because first brought into Europe by those fathers; and *p. p. t. preparatus*, prepared.

PA'BULAR. *a.* (*pabulum*, Lat.) Affording aliment or provender.

PABULATION. *s.* (*pabulum*, Lat.) The act of feeding, or procuring provender.

PA'BULOUS. *a.* (*pabulum*, Latin.) Alimantal; affording aliment (*Brown*).

PABULUM. (from *pasco*, to feed.) Food, aliment. Whence the animal heat and animal spirits are called *pabulum vitæ*, the food of life.

PACA, in zoology. See *Mus*.

PACCHIONIAN GLANDS, in anatomy. See *GLANDULÆ PACCHIONÆ*.

PACE. *s.* (*pas*, French.) 1. Step; single change of the foot in walking (*Milton*). 2. Gait; manner of walk (*Sidney*). 3. Degree of celerity (*Shakspeare*). 4. Step; gradation of business (*Temple*). 5. A measure of five feet (*Holder*).

PACE is also used to signify particular motions or progressive actions of a horse. A horse has a great variety of paces, as a walk, trot, amble, canter, gallop, rating-gallop, and at speed; some of these some horses have in great perfection, which are nevertheless exceedingly deficient in others; as for instance, a horse shall be a most excellent trotter, who happens to be a shuffling, execrable walker; he shall be a gay, airy, light figure in a canter, and wonderfully different in speed. Good gallopers, again, are very frequently bad trotters.

TO PACE. *v. n.* (from the noun.) 1. To move on slowly (*Spenser*). 2. To move (*Shakspeare*). 3. (Used of horses.) To move by raising the legs on the same side together.

TO PACE. *v. a.* 1. To measure by steps (*Shakspeare*). 2. To direct to go (*Shakspeare*).

PA'CED. (from *pace*.) Having a particular gait (*Dryden*).

PA'CER. *s.* (from *pace*.) He that paces.

PACHAMAC, or **PACHACAMA**, a town of Peru, in the audience of Lima, situate in a valley of its name, formerly beautified with a magnificent temple, built by the incas, in which the Spaniards, when they conquered Peru, found immense riches. It is 15 miles S.S.E. of Lima.

PACHETE, a fort of Hindustan, in Bengal. It gives name to a circar, and stands near the Dummuda, 10 miles N.E. of Rogo-natpour.

PACHUCA, a town of Mexico Proper, famous for the rich silver mines in its vicinity. It is 55 miles N. by E. of Mexico. Lon, 100. 14 W. Lat, 20. 42 N.

PACHYNUS, a promontory of Sicily, projecting about two miles into the sea, in the form of a peninsula, at the south-east corner of the island, with a small harbour of the same name.

PACIFIC. *a.* (*pacifique*, French; *pacificus*, Latin.) Peace-making; mild; gentle; appeasing (*Hammond*).

PACIFIC OCEAN, otherwise called the **SOUTH SEA**, lying between Asia and America, and upwards of 10,000 miles in breadth. When Magellan entered this ocean through the dangerous strait that bears his name, he sailed three months and twenty days in a uniform direction to the N.W. without discovering land. In the distress he suffered in this voyage, before he discovered the Ladrone islands, he had the consolation of enjoying

such uninterrupted fair weather, with favourable winds, that he gave this ocean the name of Pacific. The Spaniards having passed the isthmus of Darien, from N. to S. at the first discovery of this ocean, named it the South Sea; but, with respect to America, it is more properly the western ocean. On one side of the equator, it is called the North Pacific Ocean; and on the other, the South Pacific Ocean.

PACIFICATION. *s.* (*pacification*, Fr.) 1. The act of making peace (*South*). 2. The act of appeasing or pacifying (*Hooker*).

PACIFICATOR. *s.* (*pacificateur*, French; from *pacify*.) Peacemaker (*Bacon*).

PACIFICATORY. *a.* (from *pacificator*.) Tending to make peace.

PA'CIFIER. *s.* (from *pacify*.) One who pacifies.

TO PA'CIFY. *v. a.* (*pacifier*, French; *pacifico*, Latin.) To appease; to still resentment; to quiet an angry person; to compose any desire (*Bacon*).

PACK. *s.* (*pack*, Dutch.) 1. A large bundle of any thing tied up for carriage (*Cleave*). 2. A burden; a load (*L'Estrange*). 3. A due number of cards (*Addison*). 4. A number of hounds hunting together. 5. A number of people confederated in any bad design or practice (*Clarendon*). 6. Any great number, as to quantity or pressure: as, a *pack* or world of troubles.

TO PACK. *v. a.* (*packen*, Dutch.) 1. To bind up for carriage (*Otway*). 2. To send in a hurry (*Shakspeare*). 3. To sort the cards so as that the game shall be iniquitously secured (*Shakspeare*). 4. To unite picked persons in some bad design (*Hudibras*).

TO PACK. *v. n.* 1. To tie up goods (*Cleaveland*). 2. To go off in a hurry; to remove in haste (*Tusser*). 3. To concert bad measures; to confederate in ill (*Carew*).

PA'CKCLOTH. *s.* (*pack* and *cloth*.) A cloth in which goods are tied up.

PA'CKER. *s.* (from *pack*.) One who binds up bales for carriage (*Pope*).

PA'CKET. *s.* (*pacquet*, French.) 1. A small pack; a mail of letters (*Denham*). 2. A small bundle.

PACKET, or **PACKET BOAT**, a vessel appointed by the government to carry the mail of letters, packets, and expresses, from one kingdom to another by sea, in the most expeditious manner. Thus, the packet boats, under the direction of the post-master-general of Great Britain, carry the mails from Dover to Calais, from Falmouth to Lisbon, from Harwich to Helvoetsluys, and from Parkgate to Dublin. See *POST*.

TO PA'CKET. *v. a.* (from the noun.) To bind up in parcels (*Swift*).

PA'CKHORSE. *s.* (*pack* and *horse*.) A horse of burden; a horse employed in carrying goods (*Locke*).

PA'CKSADDLE. *s.* (*pack* and *saddle*.) A saddle on which burdens are laid (*Howel*).

PA'CKTHREAD. *s.* (*pack* and *thread*.) Strong thread used in tying up parcels (*Add.*).

PAC'KWAX. *s.* The strong aponeuroses on the sides of the neck in brutes (*Ray*).

PACORUS, the eldest of the thirty sons of Orodes, king of Parthia, sent against Crassus, whose army he defeated, and whom he took prisoner. He supported the republican party of Pompey, and of the murderers of Julius Cæsar, and was killed in a battle by Ventidius Bassus, B. C. 39, on the same day (9th of June) that Crassus had been defeated.

PACOS, in zoology. See **CAMELUS**.

PACT. *s.* (*pact*, Fr. *pactum*, Latin.) A contract; a bargain; a covenant (*Bacon*).

PAC'TION. *s.* (*paction*, Fr. *pactio*, Lat.) A bargain; a covenant (*Hayward*).

PACTITIOUS. *a.* (*pactio*, Lat.) Settled by covenant.

PACTOLUS, in ancient geography, a celebrated river of Lydia, rising in mount Tmolus, and falling into the Hermus, after watering the city of Sardes. It was in this river that Midas washed himself when he turned into gold whatever he touched; and from that circumstance it ever after rolled golden sand, and received the name of Chrysorrhœas. It is called Tmolus by Pliny. Strabo observes, that it had no golden sands in his age.

PACUVIUS (M.), a native of Brundisium, who distinguished himself by his skill in painting and his poetical talents. His style was rough, and without purity or elegance. He retired to Tarentum, where he died in the 90th year of his age, about 131 years before Christ.

PAD. *s.* (from *paad*, Saxon.) 1. The road; a footpath (*Prior*). 2. An easy paced horse (*Dryden*). 3. A robber that infests the roads on foot. 4. A low soft saddle (*Hudibras*).

To PAD. *v. a.* (from the noun.) 1. To travel gently. 2. To rob on foot. 3. To beat a way smooth and level.

PADANG, a seaport on the west coast of Sumatra, in the East Indies, in the possession of the Dutch. In 1797, it was almost totally destroyed by an earthquake, and upward of 300 lives were lost. Lon. 99. 46 E. Lat. 0. 50 S.

PA'DAR. *s.* Grouts; coarse flower (*Wolt.*).

PA'DDER. *s.* (from *pad*.) A robber; a foot highwayman (*Dryden*).

To PA'DDLE. *v. n.* (*patouiller*, French.) 1. To row; to beat water, as with oars (*Gay*). 2. To play in the water (*Collier*). 3. To finger (*Shakspeare*).

PA'DDLE. *s.* (*pattal*, Welsh.) 1. An oar, particularly that which is used by a single rower in a boat. 2. Any thing broad like the end of an oar (*Deuteronomy*).

PA'DDLEK. *s.* (from *paddle*). One who paddles (*Ainsworth*).

PADDOCK. *s.* (*pada*, Sax.; *padde*, Dut.) A great frog or toad (*Dryden*).

PA'DDOCK. *s.* (corrupted from *parrack*.) A small enclosure for deer, or other animals.

PADDOCK, in earlier times, signified a pasture enclosed with a wall or paling of great height, a mile in length, and a quarter of a mile broad, in which deer were coured with

greyhounds, in the same manner as hares are coured at present, but subject to rules different from those now in use. These paddocks, from their great extent, were seldom seen but in the royal parks, or upon the demesnes of the most opulent. The sport has been a long time discontinued, and the word paddock is applied in the present time only to a small enclosure or pasture, having a pale to protect it; or to a small tract of land, surrounding, or appertaining to, a rural mansion, where a few brace of fallow deer may be kept, but not of magnitude sufficient to acquire the appellation of a park.

PADERBORN, a bishopric of Germany, in the circle of Westphalia, 32 miles long and 20 broad. In the middle of it are high mountains, and iron mines; but the rest of the country is fertile in corn and pastures. It is most remarkable for its bacon and venison.

PADERBORN, an ancient and populous town of Westphalia, capital of a bishopric. It takes its name from the rivulet Pader, which rises under the high altar of the cathedral. It has a celebrated university, and is 37 miles S. W. of Minden, and 43 E. S. E. of Munster. Lon. 8. 55 E. Lat. 51. 46 N.

PA'DLOCK. *s.* (*padde*, Dutch.) A lock hung on a staple to hold on a link (*Prior*).

To PA'DLOCK. *v. a.* (from the noun.) To fasten with a padlock (*Arbuthnot*).

M. Regnier has recently invented, or rather improved, a padlock of considerable security by means of combinations, of which the following is a description.

The intention of this padlock is to secure portmanteaus, cloak bags, and other packages in the most complete manner, and to serve occasionally as defences to the key-holes of the doors of apartments.

The padlock is composed of four circular pieces of brass, on which are engraven the twenty-four letters of the alphabet. The four pieces are moveable on their axes by turning them with the finger in order to produce the combination by which it is opened.

The combination of the manufacturer is the word **ROME**: when this word is brought into a correct line with the two marks on the edges of the two steel plates FF, which form the external part of the padlock, those two plates can be separated a little from each other, and the clasp of the lock can be opened by the hinge.

The same process is used to fasten it, with this difference, that the two external plates are pressed together so as to confine the bow of the clasp of the lock in its cell at G; after which, the combination is to be shifted so that the characters shall no longer form the same word in the before-mentioned line.

The method by which the possessor may dispose of the padlock to act by a new combination, which cannot be known to any other person:

1. A screw is taken out, which passes through the centre of the plates FF. (Plate 429, fig. 1.)

2. The combination which it is intended to

set aside, namely, that which opens the lock at present must be duly arranged.

3. The marked circular pieces or rings must be taken off from four plates of brass which constitute the central part, and together form the centre-piece of the mechanism.

4. Lastly, The rings must be replaced on the centre pieces, each according to the letter the possessor may have chosen.

For example: If you would adopt the word *lock* for the combination, the letter *L* of the first ring must be placed over or upon a small steel tooth, which is attached to the first interior cylinder; the letter *O* of the second ring on the tooth of the second cylinder; the letter *C* of the third ring on the tooth of the third cylinder; and lastly, the letter *K* of the fourth tooth on the fourth cylinder.

By this means the word *lock* is set up and becomes the combination of the lock, and the word *Rome* no longer produces the disposition of parts required for the disengagement.

After this operation the screw must be replaced in the centre of the plate; this screw does not contribute to the strength of the mechanism, but is used merely to allow the exact space necessary for opening the padlock, and to prevent the separation of the rings from the central parts in the common use of the lock.

Method of using this lock as a defence to the key-hole of a door.

A ring staple *A*, having a wood screw, is fixed to the door above the key-hole or escutcheon of the lock.

A second ring *C* is fixed perpendicularly beneath the other.

A cylindrical tube of iron *D*, in the form of a bolt, is placed vertically in the ring of these screw staples. At the lower end of the tube is an aperture, through which the padlock is inserted, so that the tube or bolt cannot be raised or taken out.

By this contrivance the key-hole of the lock is completely defended, and the introduction of a pick-lock or false key is rendered morally impossible. For the mechanism presents 331,776 combinations, (equal to the 4th power of 24,) forming 331,775 different obstacles to prevent the removal of this defence by any person unacquainted with the secret of the proprietor.

If it be apprehended that the word of the combination may be forgotten, it will be easy to write and disguise it in many different ways, without any risk of discovery: for example:

The letter <i>L</i> , or eleventh letter of the	<i>L</i> .
alphabet, will be written	- - 11
The letter <i>O</i> , or fourteenth letter	- - 14
The letter <i>C</i> , or third letter	- - 3
The letter <i>K</i> , or tenth letter	- - 10

Total (expressed) *L*. 38

This little calculation will appear to any other person to be a common account, but it is to the proprietor a memorandum by which he will perfectly recollect that the first letter of his combination is the eleventh of the alpha-

bet, that the second is the fourteenth, and so of the rest.

Mr. Nicholson, who published the preceding account in his *Philosophical Journal*, says, "I find some obscurity in Regnier's description of the manner of connecting the central piece and the external engraved part. From the operation, I apprehend, 1. that each ring has a number of notches at its inner surface, that answer to the letters on its outer face; 2. that each central round piece fits the cavity of its ring, and is prevented from turning by a tooth which it lodges in one of the notches; 3. that when all the four teeth are ranged in a line between *F* and *F*, the lock will open; and therefore, 4. when any particular letter is placed over the tooth, that letter becomes the effective letter for its own ring." See *Lock*.

PADRON, a town of Spain, in Galicia, seated on the Ulla, 12 miles S. of Compostella. Lon. 8. 17 W. Lat. 42. 40 N.

PADSTOW, a seaport in Cornwall, with a market on Saturday. It has some trade to Ireland, and is seated at the mouth of the Camel, on the Bristol Channel, 30 miles W. of Launceston, and 243 W. by S. of London. Lon. 4. 45 W. Lat. 50. 42 N.

PADUA, an ancient and celebrated city of Italy, capital of the Paduan, with a university and a bishop's see. It is seven miles in circumference, and much less considerable than formerly; for great part of the circuit within the walls is unbuilt, and the town in general so thinly inhabited, that grass is seen in many places, between the stones with which the streets are paved. The houses are built on piazzas, which, when the town was in a flourishing state, may have had a magnificent appearance; but they now rather give it a more gloomy air. The Franciscan church is dedicated to St. Antonio, the great patron of the city, whose body is inclosed in a sarcophagus, under an altar in the middle of the chapel, and is said to emit a very agreeable and refreshing flavour. Pious catholics believe this to be the natural effluvia of the saint's body; while heretics assert, that the perfume proceeds from certain balsams rubbed on the marble every morning, before the votaries come to pay their devotions. The walls of this church are covered with votive offerings of ears, eyes, arms, legs, noses, and every part almost of the human body, in token of cures performed by this saint; for whatever part has been the seat of the disease, a representation of it is hung up in silver or gold, according to the gratitude or wealth of the patient. Near this church is a place, called the school of St. Antonio, where many of the actions of the saint are painted in fresco; some of them by Titian. The church of St. Justina, built from a design by Palladio (one of the most elegant he ever gave) is remarkable for its rich Mosaic pavement. The hall of the town-house is one of the largest in Europe, and contains the cenotaph of Livy, the historian, who was a native of Padua. The university, once so celebrated, is now on the decline. Here is a cloth manufacture; and it

is said that the inhabitants of Venice wear no other cloth than what is made here. The city, however, swarms with beggars, who ask charity in the name of St. Antonio. Padua was taken by the Venetians, in 1706. It is seated on the Brenta and Bachiglione, in a fine plain, 20 miles S.E. of Vicenza, and 225 N. of Rome. Lon. 12. 1 E. Lat. 45. 22 N.

PADUANO, a province of Italy, in the territory of Venice, 40 miles long and 35 broad; bounded on the E. by the Dogado, on the S. by the Polesino di Rovigo, on the W. by the Veronese, and on the N. by the Vicentino. Its soil is well watered, and is one of the most fertile in Italy. Padua is the capital.

PADULA, a town of Naples, in Principato Citereio, 14 miles N. of Policastro. Lon. 15. 41 E. Lat. 40. 29 N.

PADUS. The wild cluster cherry, or bird's cherry. *Prunus padus* of Linnæus. The bark and berries of this shrub are used medicinally. The former, when taken from the tree, has a fragrant smell, and a bitter, sub-astringent taste, somewhat similar to that of bitter almonds. Made into a decoction, it cures intermittents, and it has been recommended in the cure of the several forms of siphylis. The latter are said to cure the dysentery.

PADUS, in ancient geography, the Po.

PÆAN, among the ancient pagans, was a song of rejoicing sung in honour of Apollo, chiefly used on occasions of victory and triumph. See **APOLLO**.

PÆAN, in the ancient poetry, a foot consisting of four syllables; of which there are four kinds, the *pæan primus*, *secundus*, &c. The *pæan primus* consists of one long syllable and three short ones, or a trochæus and pyrrhichius, as *temporibus*; the *pæan secundus* consists of a short syllable, a long, and two short, or an iambus and a pyrrhichius, as *potentia*; the *pæan tertius* consists of two short syllables, a long and a short one, or a pyrrhichius and a trochæus, as *animatus*; the *pæan quartus* consists of three short syllables and a long one, or a pyrrhichius and iambus, as *celeritas*.

PÆDERIA. In botany, a genus of the class pentandria, order monogynia. Corol twisted; berry empty, brittle, two-seeded; style bifid. Two species; climbing plants of India and the Mauritius.

PÆDEROTA. In botany, a genus of the class diandria, order monogynia. Corol ringent, four-cleft, with a naked throat; calyx five-parted; capsule two-celled. Three species; natives of Italy, Austria, and Carniola.

PÆDERUS. In entomology, a Fabrician tribe of the genus **STAPHYLINUS**, which see.

PÆDO-BAPTISM. (a compound of *παις*, *paîs*, *vaîdos*, infant, and *βαπτισμός*, baptism.) Infant baptism, or that conferred on children.

PÆDO-BAPTISTS, (formed of *παις*, *paîs*, *vaîdos*, infant, and *βαπτίζω*, I baptize,) are those who maintain that baptism should be administered to infants.

PÆFENHOFFEN, a town of France, in the department of Lower Rhine, seated on the declivity of a mountain, near the river Motter, eight miles W. of Hagnenau. Lon. 7. 38 E. Lat. 48. 48 N.

PÆONIA. *Pæony*. In botany, a genus of the class polyandria, order digynia. Calyx five-leaved; petals five; styleless; capsules many-seeded. Seven species; European plants, chiefly of Siberia. The two following are cultivated.

1. *P. tenuifolia*. Slender-leaved *pæony*. Leaves twice-ternate; leaflets many-parted, naked, with linear, subulate segments; capsules downy; germs two or three, purplish, with purple hairs. Siberia.

2. *P. officinalis*. Common *pæony*. Leaves decompound, naked; leaflets lobed, the lobes broad, lanceolate; capsules nearly erect, downy.

Of this there are two principal varieties, distinguished, but improperly, on the authority of C. Bauhin, into male and female *pæony*. The flowers of the former are large and single, composed of five or six large, roundish, red petals. Those of the latter smaller, and of a deep purple colour. The flowers of both sorts appear in May; and are natives of Switzerland. The single sorts are easily raised by seeds, and the double by parting the roots. The seeds should be sown in autumn, soon after they are perfectly ripe. The roots of the old double-flowered plants may be taken up in the beginning of autumn, and divided so as to have one bud or eye or more to each part or crown, without which they will never form good plants.

This plant, both male and female, has been long considered as a powerful medicine; and till of late years had a place in the materia medica of the London College.

The roots and seeds of *pæony* have, when fresh, a faint, unpleasant smell, somewhat of the narcotic kind, and a mucilaginous, sub-acrid taste, with a slight degree of bitterness and adstringency. In drying, they lose their smell, and part of their taste. Extracts made from them by water are almost insipid, as well as inodorous; but extracts made by rectified spirit are manifestly bitterish, and considerably adstringent. The flowers have rather more smell than any of the other parts of the plant, and a rough sweetish taste, which they impart, together with their colour, both to water and spirit.

The roots, flowers, and seeds of *pæony* have been esteemed in the character of an anodyne and corroborant, but more especially the roots; which since the days of Galen have been very commonly employed as a remedy for the epilepsy. For this purpose, it was usual to cut the root into thin slices, which were to be attached to a string, and suspended about the neck as an amulet; if this failed of success, the patient was to have recourse to the internal use of this root, which Willis directs to be given in the form of powder, and in the quantity of a drachm, two or three times a day, by which, as we are informed, both infants and

adults were cured of this disease. Other authors recommended the expressed juice to be given in wine, and sweetened with sugar, as the most effectual way of administering this plant. Many writers, however, especially in modern times, from repeated trials of the pæony in epileptic cases, have found it of no use whatever; though professor Home, who gave the radix pæonia to two epileptics at the Edinburgh infirmary, declares that one received a temporary advantage from its use. Of the good effects of this plant in other disorders we find no instances recorded. See Nat. Hist. Pl. XCIII.

PÆONY. In botany. See **PÆONIA**.

PAGAN. (*paganus*.) A heathen, gentile, or idolater, one who adores false gods.

Baronius derives the word *paganus* a *pagis*, villages, because, when Christians became masters of the cities, the heathens were obliged, by the edicts of Constantine and his sons, to go and live in the country villages, &c. Salmasius will have the word come from *pagus*, considered as originally signifying *gens*, or nation: whence, he observes, we say indifferently, pagans or gentiles.

The abbot de Fleury gives another origin of pagan: he observes, that the emperor Constantine, going from Antioch, against Maxentius, in 350, assembled all his troops, and advised such as had not received baptism to receive it immediately; declaring withal, that such as should be found unbaptized should quit the service, and go home.

Hence, perhaps, says the abbot, the name pagan might be given to those who chose the latter; the Latin word *paganus* properly signifying a person who does not bear arms, in opposition to *miles*, a soldier.

And hence it might, in time, extend to all heathens. Or, continues he, the word might come from *pagus*, village, in regard the peasants were those who adhered longest to the idolatry of the heathens.

PAGAN. a. Heathenish (*Shakspeare*).

PAGAN (Blaise Francis, count de), a French mathematician; born in Provence, 1604. He entered into the army, and at the siege of Montauban lost his left eye by a musket shot. At the passage of the Alps, and at the siege of Suza, he led on his soldiers to glory, and went in 1642 with the rank of field-marshal to Portugal. Here he had the misfortune to lose his eye-sight by a distemper, and with the world thus closed upon him he retired to study and meditation. The mathematics and fortification were his favourite pursuits, and he wrote a treatise on fortification; geometrical theorems; astronomical tables; theory of the planets; historical relation of the Amazon river, 8vo.; *homme heroïque*, &c. He died at Paris, 1665.

PAGANALIA, certain festivals observed by the ancient Romans in the month of January. They were instituted by Servius Tullius, who appointed a certain number of villages (*pagi*), in each of which an altar was to be raised for annual sacrifices to their tutelary gods; at which all the inhabitants were to assist, and

give presents in money, according to their sex and age, by which means the number of country-people was known. The servants upon this occasion offered cakes to Ceres and Tellus, to obtain plentiful harvests.

PAGANELLUS, in ichthyology. See **Gobi**.

PAGANISM, the religious worship and discipline of pagans: or, the adoration of idols and false gods. See **IDOLATRY**, **MÛTHOLOGY**, and **POLYTHEISM**.

PAGE. *s.* (*page*, French.) 1. One side of the leaf of a book (*Watts*). 2. (*page*, Fr.) A young boy attending on a great person.

To PAGE. *v. a.* (from the noun.) 1. To mark the pages of a book. 2. To attend as a page (*Shakspeare*).

PAGE OF A LEAF (*Superior—inferior*): (*Pagina, superior—inferior folii*.) In botany, the upper and lower surface of a leaf: the supine and prone disk, as it is sometimes expressed.

PAGEANT. *s.* 1. A statue in a show. 2. Any show; a spectacle of entertainment (*Shakspeare*). 3. Any thing showy without stability or duration (*Pope*).

PAGEANT. *a.* Showy; pompous; ostentatious; superficial (*Dryden*).

To PAGEANT. *v. a.* (from the noun.) To exhibit in show; to represent (*Shakspeare*).

PAGEANTRY. *s.* (from *pagant*.) Pomp; show (*Government of the Tongue*).

PAGET (William lord), though but the son of a serjeant at mace, was noticed by Henry VIII. and made successively clerk of the signet, of the council, and afterwards of the privy seal. He afterwards went ambassador to France, and was soon after made secretary of state. He was ambassador to Charles V. in the next reign; but his intimacy with Somerset proved injurious to his interests, and he shared his disgrace, and was fined 6000*l*. He died 1564.

PAGI (John Baptist), of Genoa, author of a treatise on painting, in Italian, fol. was eminent not only as a painter, but as an engraver, and died at Genoa 1629, aged 74.

PAGI (Anthony), an able critic, born at Rognà, in Provence, 1624. His great work is a critique on the annals of Baronius, a most valuable performance. He wrote besides a Latin dissertation on the consular office, and other things, and died at Aix 1699.

PAGI (Francis), nephew to the preceding, was born at Lambesc in Provence, 1654. He followed his uncle's example, and greatly assisted him by his learning in the completion of his critique on Baronius, of which he published the three last volumes. He wrote besides in Latin an history of the popes, 4 vols. 4to. He died 1721. His nephew was also a man of letters, and published a history of Cyrus the Younger, 12mo, &c.

PAGINAL. *a.* (*pagina*, Lat.) Consisting of pages (*Brown*).

PAGLIANO, a town of Naples, in Abruzzo Ulteriore, 115 miles E.S.E. of Aquila. Lon. 13. 46 E. Lat. 42. 28 N.

PAGO, an island in the gulf of Venice, separated from Venetian Dalmatia by a narrow strait. The air is cold, and the soil barren; but it is well peopled, and contains salt works. Lon. 15. 11 E. Lat. 44. 40 N.

PAGOD, or **PAGODA**, a name whereby the East Indians call the temple in which they worship their gods. Before they build a pagod they consecrate the ground as follows: after having inclosed it with boards or palisades, when the grass is grown on the ground they turn an ash-coloured cow into it, who stays there a whole day and night; and as cow-dung is thought by the Indians to be of a very sacred nature, they search for this sacred deposit, and having found it, they dig there a deep pit, into which they put a marble pillar, rising considerably above the surface of the earth. On this pillar they place the image of the god to whom the pagod is to be consecrated. After this the pagod is built round the pit, in which the pillar is fixed. The pagod usually consists of three parts: the first is a vaulted roof supported on stone or marble columns. It is adorned with images, and, being open, all persons without distinction are allowed to enter it: the second part is filled with grotesque and monstrous figures, and nobody is allowed to enter it but the bramins themselves: the third is a kind of chancel, in which the statue of the deity is placed: it is shut up with a very strong gate.

The word is sometimes used for the idol, as well as for the temple.

PAGOD is also the name of a gold coin, current in several parts of the Indies, on the footing of the piece of eight. The English coin pagods at Fort St. George, and the Dutch at Palicate.

There are also silver pagods struck at Narisingua, Bisnagar, &c. which usually bear the figure of some monstrous idol: whence their names. They are of various values.

PAGURUS. In the entomological system of Fabricius, a tribe of the genus **CANCER**, which see.

PAID. The pret. and part. passive of *pay*.

PAIGLE. *s.* A flower, also called cow-slip.

PAIL. *s.* (*paila*, Spanish.) A wooden vessel in which milk or water is commonly carried.

PAILFUL. *s.* (*pail* and *full*.) The quantity that a pail will hold (*Shakspeare*).

PAILMAIL. *a.* Violent; boisterous (*Digby*).

PAIN. *s.* (*peine*, French.) 1. Punishment denounced (*Sidney*). 2. Penalty; punishment (*Bacon*). 3. Sensation of uneasiness (*Bacon*). 4. (In the plural.) Labour; work; toil. 5. Labour; task (*Spenser*). 6. Uneasiness of mind; anxiety (*Prior*). 7. The throws of childbirth (*Samuel*).

To **PAIN**. *v. a.* (from the noun.) 1. To afflict; to torment; to make uneasy (*Jeremiah*). 2. To labour (*Spenser*).

PAINBOEUF, a seaport of France, in the

department of Lower Loire, at the mouth of the Loire. Hence all the ships belonging to Nantes take their departure, and here they anchor on their arrival. It is 20 miles W. of Nantes. Lon. 1. 53 W. Lat. 47. 15 N.

PAINFUL. *a.* (*pain* and *full*.) 1. Full of pain; miserable; beset with affliction (*Mil.*). 2. Giving pain; afflictive (*Addison*). 3. Difficult; requiring labour (*Shakspeare*). 4. Industrious; laborious (*Dryden*).

PAINFULLY. *ad.* (from *painful*.) 1. With great pain or affliction. 2. Laboriously; diligently (*Raleigh*).

PAINFULNESS. *s.* (from *painful*.) 1. Affliction; sorrow; grief (*South*). 2. Industry; laboriousness (*Hooker*).

PAINIM. *s.* (*payen*, French.) Pagan; infidel (*Peacham*).

PAINIM. *a.* Pagan; infidel (*Milton*).

PAINLESS. *a.* (from *pain*.) Free from pain; void of trouble (*Dryden*).

PAINSTAKER. *s.* (*pains* and *take*.) Labourer; laborious person (*Gay*).

PAINSTAKING. *a.* (*pains* and *take*.) Laborious; industrious.

PAINSWICK, a town in Gloucestershire, with a market on Tuesday. It has a manufacture of white cloths for the army, and for the India and Turkey trade; and hence is brought a stone, remarkable for its beauty and neatness, for the pavement of floors. Painswick is situate so high, as every way to command extensive views over a vale of vast richness and variety, of the windings of the Severn, Malvern Hills, and parts of the counties of Salop, Hereford, and Monmouth. It is seven miles S.E. of Gloucester, and 101 W. by N. of London. Lon. 2. 11 W. Lat. 52. 46 N.

To **PAINT**. *v. a.* (*peindre*, French.) 1. To represent by delineation and colours. 2. To cover with colours representative of something (*Shakspeare*). 3. To represent by colours, appearances, or images (*Locke*). 4. To describe; to represent (*Shakspeare*). 5. To colour; to diversify (*Spenser*). 6. To deck with artificial colours (*Shakspeare*).

To **PAINT**. *v. n.* To lay colours on the face (*Pope*).

PAINT. *s.* (from the verb.) 1. Colours representative of any thing. 2. Colours laid on the face (*Anon.*).

PAINT, a term used to express more particularly the preparations employed in painting houses.

The principal article in the various compounds being white lead, the grinding of which is extremely detrimental to health, we shall state the following process, lately invented by M. A. A. De Vaux, and communicated for the benefit of the public: should it prove to be an effectual substitute for the pernicious paint now employed, it will be of inestimable service to society. He directs two Paris pints of sweet skimmed milk (two quarts English measure); six ounces (6½ ounces English averdupois) of fresh slaked lime; four ounces of nut, caraway, or linseed oil, and three

pounds of Spanish white, to be used in the composition. The lime must first be introduced into a stone vessel; to which should be added such a proportion of milk as will produce a mixture resembling thin cream. Next, the oil is to be gradually poured in; the whole being gently stirred, and the remainder of the milk added. The Spanish white must next be crumbled in, or scattered on the surface of the fluid, which it gradually imbibes, and at length sinks; when the whole should be briskly agitated.

M. De Vaux observes, that the milk ought not to be sour; because, in such case, it would form with the lime a calcareous acetite, which strongly attracts moisture. Either of the oils above-mentioned may be used; but, if white paint be required, that of caraways is preferable; as it is perfectly transparent.—In order to obtain a distemper or size-colour, the paint thus prepared may be tinged with levigated charcoal, yellow ochre, &c. for painting with which, the most common oils may be used.

The quantity here prescribed is, farther, stated to be sufficient for the first coat of six toises, or from twenty-four to twenty-seven square English yards: it may be applied in the usual manner; and costs in Paris the sum of nine sols, or 4½d. sterling.

PAINTED LADY. In botany. See **DIANTHUS**.

PAINTED LADY PEA. See **LATHYRUS**.

PAINTER. *s.* (*peintre*, French.) One who professes the art of representing objects by colours (*Dryden*).

PAINTING, is the art of representing all objects of nature visibly, by lines and colours on a plain surface. It has also the power of expressing by the same means conceptions and images of the mind which do not actually exist in any of the usual forms of nature. It is to be considered as an art displaying either conjointly or separately the powers of imagination and imitation: and may be divided into invention, which regards the original thought or conception of the subject; and into composition, design, and colouring, which regard the execution of the work.

Invention consists generally in the choice of such subjects as are best calculated to answer some great and interesting end; and particularly in discovering or selecting such subjects as are capable of being most appropriately expressed by painting, and of producing a powerful effect by such means as are distinctively placed within the compass of that art.

Composition regards the arrangement of the subject both as to forms, and to the general effects of light and shade, and of colour. It comprehends the general distribution and grouping of the figures, their combination or contrast, the choice of attitudes, the disposal of draperies, the situation of the scene itself, as well as the distribution and connection of all the various parts of scenery and ornament.

The important objects which design embraces will be found fully explained under that article. See **DESIGN**.

Colouring regards, first, the infinite variety of hues with which nature distinguishes her forms,

agreeably to the degree and mixture of the rays of light which their surfaces reflect: and, secondly, the distribution, apposition, and accompaniment, of various hues or tints, so as to produce the effect most pleasing to the sight, a circumstance in which nature always delights.—It embraces also the light and shade of objects, as far as by the diminution or increase of these the harmony of tints before-mentioned can be effected; but that mixed effect of colour and of light and shade which is denominated *chiaroscuro*, is more justly regarded as a branch of composition.

As all the objects of nature are susceptible of imitation by the pencil, the masters of this art have applied themselves to different subjects, each one as his talents; his taste, or inclination, may have led him. From whence have arisen the following classes.

I. *History-painting*: which represents the principal events in history sacred and profane, real or fabulous; and to this class belongs allegorical expression. These are the most sublime productions of the art; and in which Raphael, Guido, Rubens, Le Brun, &c. have excelled.

II. *Rural history*; or the representation of a country life, of vil ages and hamlets, and their inhabitants. This is an inferior class; and in which Teniers, Breughel, Watteau, Morland, &c. have great reputation, by rendering it at once pleasing and graceful.

III. *Portrait-painting*; which is an admirable branch of this art, and has engaged the attention of the greatest masters in all ages, as Apelles, Guido, Vandyke, Rembrandt, Regaids, Pesnee, Kneller, La Tour, &c.

IV. *Grotesque histories*; as the nocturnal meetings of witches; sorceries and incantations; the operations of mountebanks, &c.; a sort of painting in which the younger Breughel, Teniers, and others, have exercised their talents with success.

V. *Battle-pieces*; by which H. Chetemberg, Wouwerman, &c. have rendered themselves famous.

VI. *Landscapes*; a charming species of painting, that has been created by masters of the greatest genius in every nation.

VII. *Landscapes diversified with waters*; as rivers, lakes, cataracts, &c.; which require a peculiar talent, to express the water sometimes smooth and transparent, and at others foaming and rushing furiously along.

VIII. *Sea-pieces*; in which are represented the ocean, harbours, and great rivers; and the vessels, boats, barges, &c. with which they are covered; sometimes in a calm, sometimes with a fresh breeze, and at others in a storm. In this class Backhuysen, Vanderveide, Blome, and many others, have acquired great reputation.

IX. *Night-pieces*; which represent all sorts of objects, either as illuminated by torches, by the flames of a conflagration, or by the light of the moon. Schalck, Vanderneer, Vanderpool, &c. have here excelled.

X. *Living animals*: a more difficult branch of painting than is commonly imagined; and in which Rosa, Carré, Vanderveide, and many others, have succeeded marvellously well.

XI. *Birds of all kinds*; a very laborious species, and which requires extreme patience minutely to express the infinite variety and delicacy of their plumage.

XII. *Culinary-pieces*; which represent all sorts of provisions and animals without life, &c. A

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species much inferior to the rest, in which nature never appears to advantage, and which requires only a servile imitation of objects that are but little pleasing. The painting of fishes is naturally referred to this class.

XIII. *Fruit-pieces*, of every kind, imitated from nature.

XIV. *Flower-pieces*; a charming class of painting, where art in the hands of Huyzsum, P. Segerts, Merian, &c. becomes the rival of nature. Plants and insects are usually referred to the painters of flowers, who with them ornament their works.

XV. *Pieces of architecture*; a kind of painting in which the Italians excel all others. Under this class may be comprehended the representations of ruins, sea-ports, streets, and public places: such as are seen in the works of Caneletti, and other able masters.

XVI. *Instruments of music, pieces of furniture*, and other inanimate objects; a trifling species, and in which able painters only accidentally employ their talents.

XVII. *Imitations of bas reliefs*; a very pleasing kind of painting, and which may be carried by an able hand to a high degree of excellence.

XVIII. *Hunting-pieces*; these also require a peculiar talent, as they unite the painting of men, horses, dogs and game, to that of landscapes.

We shall not here attempt to prescribe rules for the art of painting. Good masters, academies of reputation, and a rational practice, are the only true sources from whence the young painter must derive the detail of his art; and for this reason we shall avoid enlarging on that part of painting of which words are incompetent to convey an idea. It will be more interesting to the general reader, if we here give a brief history of the rise and progress of painting, and of the different schools, in ancient and modern times.

It is to be imagined that men must naturally, and very early, have conceived an idea of the first principles of the art of painting; the shadow of each plant and animal, and of every object in nature, must have afforded them the means of conceiving, and pointed out the possibility of imitating, the figures of all bodies. Thus the savage nations, an emblem of what men were in the infancy of society, possess the first rudiments of this art, even before those which are useful and almost necessary to existence; their naked bodies are covered with punctures of various forms, into which they infuse indelible colours. The next demand for this art is to preserve the memory of warlike exploits. It is more natural to form some representation of an action, than to give an account of it by means of arbitrary characters. Hence the picture-writing of the Mexicans, and the more artful hieroglyphics of Egypt.

Painting consisted of simple outlines long before the expression of relief or the application of colour. It was simply drawing; and the master-pieces of painting in that rude period were not superior to the sports of children. Although occupied about a single point, it was not brought to perfection: for constant experience instructs us that men never excel in the inferior parts of an art till they are capable of carrying the whole to perfection.

After employing for a long time those simple outlines, the next step in the art of painting was to make the imitation more complete, by applying

colours: this was first accomplished by covering the different parts of the figure with different colours in the same way that we colour maps; and several nations, as the Egyptians, the Chinese, and the different nations of India, have never painted in a better manner. Other nations, more ingenious and more attentive to the arts, observing that the objects of nature have relief, have invented what is called *claro-obscuro*. The Greeks, the most ingenious, penetrating, and delicate of all, invented this part antecedent to colours; than which there cannot be a greater proof of their exquisite taste, as the glare of colours without judgment excites more admiration in the minds of the vulgar and ignorant, than the *camaieu* or drawings of one colour executed by the most skillful artist.

These general observations concerning the gradual improvement of this art will be best illustrated by a more particular attention to the ancient nations in which it flourished.

Plato, who lived 400 years before the Christian era, informs us that painting had been practised in Egypt for ten thousand years; that some of the productions of that high antiquity were in existence; and that they bore an exact resemblance to those which the Egyptians executed in his time. Without regarding the period of ten thousand years mentioned by Plato, it is reasonable to consider it as an indeterminate period, which carries us back to very remote antiquity.

The figures either in the painting or sculpture of Egypt were extremely stiff; the legs were drawn together, and their arms were pasted to their sides. It appears that their only model was their mummies, and that their skill in anatomy was derived from embalming them. They were extremely incorrect in every part of the head; they placed the ears much higher than the nose. Besides, they gave the face the form of a circle instead of an oval; the chin was short and rounded; the cheeks excessively so; and they turned upwards the corners of the mouth and eyes. Many of these faults may be ascribed to the formation of the human face in Egypt; but the placing of the ears could only be founded in caprice or ignorance.

The exactness of the Egyptian proportion is much celebrated; but although we grant that they observed the proper length of the different parts of the human body, they were still defective artists, since they did not observe the breadth, and were moreover ignorant altogether of the shape and size of the muscles. Works converted to religious purposes chiefly occupied the Egyptian painters. They had figures for imitation from which they would not depart, and those figures were monstrous; the bodies of animals with the heads of men; the bodies of men with the heads of animals: or, if the figure was more agreeable to nature in its parts, yet it was so deformed and imaginary, as to have nothing similar to it as a whole in the creation of God.

The monuments of Egyptian painting with which we are best acquainted (says Winklemann) are the chests of mummies. These works have resisted the injuries of time, and are still submitted to the examination of the curious. The white, made of white lead, is spread over the ground of the piece; the outlines of the figure are traced with black strokes, and the colours are four in number; namely, blue, red, yellow, and green, laid on without any mixture or shading. The red and blue prevail most; and those colours

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seem to have been prepared in the coarsest manner. The light is formed by leaving those parts of the ground where it is necessary, covered with the white lead, as it is formed by the white paper in some of our drawings. This description is sufficient to convince us that the whole art of painting in Egypt consisted in colouring; but every person knows, that without tints and the mixture of colours, painting can never arrive at great perfection.

In Upper Egypt there seems to have existed a kind of colossian painting, which has never been examined except by travellers who were no great critics in the art. Winklemann had some reason to express a desire that those remains of antiquity, with regard to the manner of working, the style, and the character, had been accurately explored. Walls of 24 feet in height, and pillars of 32 feet in circumference, are wholly covered with those colossian figures. According to Norden they are coloured in the same manner with the mummies: the colours are applied to a ground prepared in manner of fresco; and they have retained their freshness for many thousand years. Winklemann adds, that all the efforts of human skill and industry could make as little impression on them as the injuries of time. His enthusiasm for antiquity has perhaps led him into this extravagant exaggeration.

It appears that the great employment of the Egyptian painters was on earthen vessels, on drinking cups, in ornamenting barges, and in covering with figures the chests of mummies. They painted also on cloth; but painting, as an industrious occupation, supposes a workman, not an artist: the decoration of temples, house-painting, and that of the figures relative to religion, are to be considered only in this point of view. The workmen in Russia who paint our Saviour holding the globe in one hand, and blessing the people with the other, are not members of the imperial academy of fine arts.

Pliny informs us that the Egyptian artists painted also the precious metals; that is to say, they varnished or enamelled them. It is doubtful what this art was, but most probably it consisted in covering gold or silver with a single colour.

The Egyptians are supposed to have continued this coarse style till the reign of the Ptolemies.

The Persians were so far from excelling in the arts, that the paintings of Egypt were highly esteemed among them after they had conquered that country.

The carpets of Persia were of great value in Greece, even in the time of Alexander the Great, and these were adorned with various figures; but this is no proof that they were well executed, any more than a demand for several of the Chinese productions is at present a proof of the taste of that people in the arts. It was the fabrication of the silk, and not the truth of the representation, which made the Greeks admire the carpets of Persia.

The Persians, as well as the Arabians, had some knowledge of Mosaic work. This is only valuable when it copies, in a manner that cannot be destroyed, the works of a great master; but if the Persians had no good pictures to copy into Mosaic, it was of no consequence to be able to arrange, in a solid manner, pieces of flint one beside another.

There is only one Persian painter whose name has descended to posterity; and he is preserved, not because he was a painter, but because he ac-

commodated the ancient doctrine of the two principles to the Christian religion. Besides, it is doubted whether Manes was a Persian or a Greek, and it is still less known whether he was a painter. He is praised in Asia for drawing straight lines without a ruler.

The modern Persians have made no kind of progress in the arts. The emperor Schah-abbas, wishing from caprice to be instructed in drawing, was obliged to have recourse to a Dutch painter who happened to be in his dominions.

The modern Persians paint on cloth, and the artists in India are their rivals in this branch of industry; but their paintings are purely capricious. They represent plants and flowers which have no existence in nature; and their only merit consists in the brightness and the strength of their colours.

Besides this, the art in India, as it was in the most remote antiquity, is confined to monstrous figures connected with their religion, animals not to be found in the world, and idols with a multitude of arms and heads, which have neither exactness in their forms nor proportions. See **POLYTHEISM**.

The paintings of Thibet discover great patience in the artist, and are remarkable for the fineness of their strokes. Their painters might dispute with Apelles and Protogenes for extreme tenuity of pencil; but it is in this alone, without any regard to the art, in which their merit consists.

Some of the idols in Thibet are executed in a certain style of relieve; but those productions are not only imperfect, they are also so destitute of beauty as to forbid every hope of excellence in the art. The same thing may be observed with regard to many of the eastern nations; they seem to have that want of style which would for ever condemn them to mediocrity, even if they should happen to arrive at it.

An obscure Italian painter, named Giovanni Ghirardini, who travelled into China, whose judgment is more to be depended on in an art which he practised than that of other travellers, declares that the Chinese have not the least idea of the fine arts; and this opinion is confirmed by every thing which we know of that people.

The Chinese seem not to have the smallest conception of perspective. Their landscapes have no plan, no variety in the appearance of the clouds, and no diminishing of the objects in proportion to their distance.

The great object of their painting seems to consist in making their figures as unlike nature as possible: it is a serious caricature of the human figure.

To make the art flourish, it is necessary that the artist be esteemed and rewarded. In China, there is no artist so poorly paid as the painter.

The ignorant admire the brightness and purity of their colours; but simple colours appear always bright and pure: the difficulty of the art consists in melting them into one another in such a manner that the mixture shall not be perceived. It must at the same time be confessed, that their natural colours are more brilliant than ours; but if there be any merit in this, it is to be ascribed to their climate, not to their ability.

A Jesuit missionary, who in his youth had been a grinder of colours, was raised to the greatest eminence as a painter in the imperial court of China, and Raphael himself was never so much respected. The Chinese battles sent from that

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country to Paris to be engraved, are the works of the Jesuits; and except they were done by the Chinese themselves, it is impossible to conceive that they could be worse executed.

The Chinese, like other eastern nations, have a few simple strokes which they repeat in all their variety of figures. In the figures on the earthenware, they discover no knowledge of forms, no expression of the most conspicuous muscles, and no idea of proportion. And in all the paintings of China, anatomy seems to bear no relation to the art. Some heads done by a Chinese painter have a sort of resemblance to nature, but they are in a low and vicious taste: the fulness of the drapery conceals the parts in such a manner that they do not seem to exist under it. Sculpture in China is in a state of no great perfection, but at the same time it is better executed than their paintings.

The ancient inhabitants of Etruria, now called Tuscany, were the first who connected the arts with the study of nature. In some of their monuments which still remain there is to be observed a first style, which shows the art in its infancy; and a second, which, like the works of the Florentine artists, shows more of greatness and exaggeration in the character than precision or beauty.

Pliny says that painting was carried to great perfection in Italy before the foundation of Rome; perhaps he means in comparison with the infancy of the art in Greece at that period; but it appears that even in his time the painters of Etruria were held in great reputation.

The only Etrurian paintings which remain have been found in the tombs of the Tarquins. They consist of long painted friezes, and pilasters adorned with huge figures, which occupied the whole space from the base to the cornice. These paintings are executed on a ground of thick mortar, and many of them are in a state of high preservation.

Winklemann is of opinion that the Greek colonies established at Naples and Nola had at a very early period cultivated the imitative arts, and taught them to the Campanians established in the middle of the country. This learned antiquarian considers as work purely Campanian, certain medals of Capua and Teanum, cities of Campania into which the Greek colonies never penetrated. The head of a young Hercules, and the head of a Jupiter, according to Winklemann, are executed in the finest manner. It is still a question, however, in the learned world, whether these medals owe their existence to Carthage or to Campania.

"But there have been discovered (adds Winklemann) a great number of Campanian vases covered with painting. The design of the greatest part of these vases (says he) is such, that the figures might occupy a distinguished place in a work of Raphael. Those vases, when we consider that this kind of work admits of no correction, and that the stroke which forms the outline must remain as it is originally traced, are wonderful proofs of the perfection of the art among the ancients." Winklemann had an opportunity of examining a very fine Campanian vase, on which was painted a burlesque representation of the loves of Jupiter and Alcmena. But as this must have been derived from some fragment of a Grecian comedy, the count de Caylus is persuaded that the Campanian vases are of Greek origin.

Although the history of Greek painting be more fully known than that of the same art among the barbarous nations, it is nevertheless involved

in much obscurity. Pliny is almost the only author who has preserved the materials of its history; and he complains, that on this occasion the Greek writers have not discovered their usual exactness. They place, says he, the first painter of whom they speak in the 90th Olympiad, 420 years before the Christian era. It is certain that painting in dry colours existed at the time of the siege of Troy, or at least when Homer wrote the account of it. The buckler of Achilles is a sufficient proof that the Greeks were then acquainted with the basso-relievo; a kind of sculpture which bears a near affinity to painting.

In the Iliad, Helen is represented as working at a tapestry, whereon she figured the numerous combats of which she was the cause. When Andromache was informed of her husband's death, she was occupied in representing on tapestry flowers of various colours. From these facts, it is certain that painting was not confined to simple strokes, nor even to the camaieu; and hence it is reasonable to conclude, that what is called lincary painting was practised long before the time of Homer. Polygnotus of Thasos, who lived about 420 years before the Christian era, was the first painter of any eminence in Greece. Pliny informs us that he was the first who clothed his female figures, who varied the colours of the different parts of their dress, or who opened their mouths in such a manner as to show their teeth. Aristotles, who flourished in a subsequent period, allows this painter to have excelled in expression. But the art of painting may be still considered in its infancy in Greece; till about 400 years before the Christian era, when Zeuxis and Parrhasius flourished. In the contest between these eminent painters, Zeuxis declared himself to be overcome, because in a cluster of grapes which he painted he had deceived the birds; whereas Parrhasius in a curtain which he executed deceived his rival. The principal works of Zeuxis are his Penelope, in which, according to Pliny, he appears to have expressed the manners of that princess; a Jupiter surrounded by the gods; a Hercules strangling the serpents in the presence of Amphitrion and Alcmena; an Helen and a Marsyas bound. From this enumeration of these works, and from the fame which they have acquired, it is evident that the difficult parts of the art, and those which in the execution render it estimable, were now begun to be studied. By Apelles, Protogenes, and Euphranor, it was carried to the greatest height of perfection. Grace, and symmetry, and proportion, and illusion, were now added by the greatest masters to the noblest objects of nature.

We have already seen, that before the foundation of Rome the arts were cultivated in Etruria. They were also early introduced into Latium; but whether that country employed its own artists or those of Etruria, remains altogether uncertain. One need not be astonished, that at a period when the arts were in their infancy in Greece, they were raising statues to their kings in Rome: but at that period all their artists were Etrurians or Latins; and when they conquered Italy, they made all the nations of it as barbarous as they were themselves.

In the year 259 from the building of the city of Rome, and 494 years before the Christian era, Appius Claudius consecrated a number of shields in the temple of Bellona, which contained in basso-relievo the portraits of his family. This example was followed; and in process of time it was common among the Romans to place those images in

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private houses. The execution in basso-relievo is a proof that they had an idea of painting, at least with one colour. As long as the Romans employed artists of other nations, they had little desire to cultivate the arts; but towards the year of Rome 450, and 303 years before Christ, one of the Fabii thought it no discredit to a noble family to employ himself in painting. He painted the temple of Safety; and his works remained till that temple was destroyed by fire, in the reign of Claudius. It is worthy of remark, that the same man was the first painter and the first historian in his country.

The example of Fabius, surnamed Pictor from his profession, did not excite his fellow-citizens to imitation. A century and a half elapsed before the tragic poet Pacuvius, nephew of Ennius, painted the temple of Hercules in the *forum boarium*. The glory which he had acquired by his dramatic works shed some lustre on the art, which he condescended to exercise; but did not confer on it that respect which could recommend it to general practice. The paintings of Fabius were the works or rather the recreations of his youth; those of Pacuvius, the amusements of his old age; but painting is a difficult art, which requires the whole attention, and which can never be prosecuted with success, except those who love it are solely devoted to the performance.

It appears that there were no eminent painters at Rome till the time of the emperors; but as the national spirit was changed, the profession of the fine arts acquired more respectability. The Romans, during the time of the republic, were animated with the spirit of liberty and the desire for conquest. When these two passions were weakened, the love of the arts obtained among them. As a proof of this it is sufficient to say, that Nero himself gloried in being an artist. A colossian picture of 120 feet was painted at Rome by the command of this emperor, which was afterward destroyed by lightning. The name of the painter is not recorded, and there are various opinions concerning the merit of the performance; but the thing chiefly worthy of observation is, that this is the only painting on cloth mentioned by ancient authors.

The paintings of the ancient artists were either moveable or on the ceilings or compartments of buildings. According to Pliny, the most eminent were those who painted moveable pictures. The latter were either on fir-wood, larch, boxwood, or canvas, as in the colossian picture mentioned above, and sometimes on marble. When they employed wood, they laid on in the first instance a white ground. Among the antiquities of the Herculaneum are four paintings on white marble.

Their immoveable paintings on walls were either in fresco or on the dry stucco in distemper. Indeed all the ancient paintings may be reduced to, first, fresco painting; secondly, water-colour or distemper-painting on a dry ground; and, thirdly, encaustic painting.

The ancient fresco-paintings appear to have been always on a white stucco-ground, the colours inlaid very deep, and the drawing much more bold and free than any similar performance of modern art. The outlines of the ancient paintings on fresco were probably done at once, as appears from the depth of the incision and the boldness and freedom of the design, equal to the care and spirit of a pencilled outline.

In general the ancients painted on a dry ground, even in their buildings, as appears from the Herculanean antiquities, most of which are

executed in this manner. At Rome and Naples, the first (deepest) coat is of true Puzzolana, of the same nature with the terras now used in mortar, required to keep out wet, about one finger thick; the next of ground marble or alabaster, and sometimes of pure lime or stucco, in thickness about one third of the former. Upon this they appear to have laid a coat of black, and then another of red paint; on which last the subject itself was executed. Such seems to have been their method of painting on walls; but in their moveable pictures, and in the performance of their first artists, and where effect of shade and light were necessary, they doubtless used white.

The colours employed they seem to have mixed up with size, of which they preferred that made by boiling the ears and genitals of bulls. This appears to have made the colours so durable and adhesive, that the ancient paintings lately found bear washing with a soft cloth and water, and sometimes even diluted aquafortis is employed to clean their paintings on fresco. Pliny says that glue dissolved in vinegar and then dried, is not again soluble.

What the encaustic painting of the ancients was, has been much disputed. From the works of Vitruvius and Pliny, it appears evidently that it was of three kinds. First, where a picture painted in the common way was covered with a varnish of wax melted, diluted with a little oil, and laid on warm with a brush. Secondly, where the colours themselves were mixed up with melted wax, and the mixture used while warm. And, thirdly, where a painting was executed on ivory by means of the cestrum or viriculum. Some experiments on this last method by Mr. Colebrook may be found in the Phil. Trans. vol. 51. and more particular directions in Muntz's Treatise on Encaustic Painting.

It appears from ancient writings of the best authority, that in the earliest and purest times of this art, the painters used few colours, perhaps not more than four. "The paintings of the ancients (says Dionysius Halicarnassensis) were simple and unvaried in their colouring, but correct in their drawing, and distinguished by their elegance. Those which succeeded, less correct in their drawing, were more finished, more varied in their light and shades, trusting their effect to the multitude of their colours." But no certain conclusion can be drawn, that the more early among the great painters of the ancients, such as Apollodorus, Zeuxis, Timanthes, &c. had no more colours than four to use, merely because they did not use them. On the contrary, it may be conjectured with some degree of probability, from their chasteness in design, and from the complaints Pliny makes of the gaudy taste of the Roman painters, that the Greeks in general were designedly chaste in their colouring, and not so merely from necessity, at least about the time of Zeuxis and Apelles; for the former could not have painted grapes so naturally as he is said to have done with four colours only: and the rebuke given by the latter to one of his scholars who had painted an Helen very gaudily, is a confirmation of these observations. "Young man (says Apelles), not being able to make her beautiful, you have made her rich."

Of white colouring substances, the ancients had white lead variously prepared, a white from calcined egg-shells, and preparations from cretaceous and argillaceous earths. The moderns in addition have magistery of bismuth, little used; and ought to have the calces of tin and zinc.

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Of blacks, the ancients had preparations similar to lamp, ivory, blue, and Frankfort black; also to Indian ink and common writing ink; and they used, what we do not, the precipitate of the black dyers vats.

The ancients possessed a species of vermilion or fine cinnabar, a coarser cinnabar, red-lead, various earths burnt and unburnt, apparently, similar to our red ochre; Venetian red, Indian red, Spanish brown, burnt terra de Siena, and scarlet ochre; they had also a substance alike in colour and in name to our dragon's blood.

The yellow pigments of the ancients were generally the same with our ornaments, king's-yellow, Naples-yellow, &c. They did not possess turbeth-mineral, mineral-yellow, or gamboge; nor do they appear to have known of gall-stone as a pigment.

Of blue paints they had preparations from the lapis syanus and lapis armenus. Indigo they had, and perhaps bice and smelt; for they made blue glass, but whether from some ore of cobalt or of wolfram must be uncertain: they had not Prussian blue, verditer, nor litmus, which we have. We do not use the blue precipitate of the dyers vats, nor mountain blue, which they certainly employed.

Of green colours, they had verdegis, terra vert, and malashite or mountain green. The latter is not in use among us. Sap green, green verditer, and Scheele's green, appear to have been unknown to them: like us, they procured as many tints as they pleased from blues and yellow vegetables.

We have no original purple in use: that from gold by means of tin, though very good when well prepared, is too dear perhaps, and unnecessary. Their purple was a tinged earth. Their orange or sandarac (red orpiment) we also possess. Hence there does not appear to have been any great want of pigments, or any very material difference between the colours they used and such as we generally employ. Perhaps the full effect of colouring may be obtained without the use of the exceeding brilliant pigments, depending chiefly on the proportion and opposition of tints.

The ancients could not know any thing about the spirit varnishes, distillation being a modern invention; but they were undoubtedly acquainted with the use of the better oil varnishes, that is, with the use and effect of resinous gums dissolved in boiling inspissated oils.

One of the best preserved mummies in the British museum has an astonishing brightness of colours on the outside of the coffin. Thousands of years have not impaired them; they are as fresh as if they had been laid on yesterday.

The chalk ground, and the excellency of the colours, some of which imply a good deal of chemical and metallurgical knowledge, do not sufficiently account for their splendour and freshness: it must be owing to other circumstances: either to the mixture of shining colours, or to a hard glossy skin which visibly covers them all over.

From an accurate examination of one of those mummies belonging to the university of Cambridge, it appeared, that the varnish which covered the colours could not be dissolved, or in the least affected by common water; and that it equally resisted the dissolving power of the strongest spirits: hence it is reasonable to conclude, that the coffins of the mummies were not covered with size, whites of eggs, simple gums, or any preparation of wax, but with a fine transparent oil

varnish. It was discovered at the same time, that the colours themselves were not prepared or mixed with oil; for where the external glossy skin was damaged, broken, or rubbed off, even common water would wash the colours away, and affect the chalk ground under them.

Pliny has described the general and particular effects of the varnish of Apelles, under the name of atrament, so distinctly, that nobody can mistake the thing or the mixture he is speaking of. He has mentioned the shining glossy skin of the varnish which excites the brightness of the colours, and preserves them against dust; he observed, that this skin was laid on so thin, that it could not be discerned at any distance: nor was he less accurate in reporting the particular effects of that mixture which Apelles made use of; it harmonised and lowered the tone of the brightest florid colours in an imperceptible manner, and the whole appeared as if it had been seen through isinglass. The chemists and connoisseurs are fully of opinion, that no liquid substance or mixture of any kind is fit to produce these effects besides the oil varnishes: and if there are not, Apelles and the Greeks were certainly acquainted with those varnishes; a fact which might be strongly urged in behalf of their knowledge of oil colours.

The black outlines of the figures on the most ancient Greek paintings yet extant, that is, on Etruscan vases, are so sharp, so thick, and drawn in so easy and masterly a manner, that one cannot help looking upon them as having been drawn in oil colours. Had they been in distemper or water colours on the red clay ground on which they are applied, they would have been imbibed and soaked into it. Our china and enamel painters prepare and apply their colours with spike or other liquid oils; and the Greek masters seem to have done the same, unless they should appear to have burnt their vases before they painted them, or to have used a mixture of dissolved wax or gum for giving a body to their colours, which might have answered the same end as oils. And this is the more probable, as there is some reason to believe that these vases went through two different fires, that of baking them, and that of smelting or burning in their colours.

The Greek and Roman paintings that have been preserved or discovered at Rome and Herculaneum do not countenance the supposition of oil colours; at least Turnbull and the academists at Naples, who have described the royal collection at Portici, Cochin, and many other authors who have seen and described them, do not hint any thing of that nature. On the other hand, Vitruvius, who has left us so many valuable notices of the ancient arts, acquaints us, that there was a kind of painting which absolutely required a mixture of oil: and Pliny, to the same purpose, expressly says, "Sun and moon shine are inimical and obnoxious to red lead. The remedy is to apply the red wax when hot and melted with some oil on the well-dried walls, which is to be done with brushes."

From these observations, the evidence which the ancients have given us in behalf of themselves, and of their knowledge of oil painting, may be summed up in a few words.

Their having been acquainted with the white chalk ground, which many modern masters have used for oil painting on boards, proves no more than that the ancients might have done the same.

The oil varnishes used by the Egyptians and by Apelles might have brought them to the discovery of oil painting; but as it appears both

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from mummies and from the works of Pliny, that their colours were not prepared and mixed with that varnish, and as it is plain rather that this varnish was externally laid over the finished pictures; no other conclusion can be drawn, except that they were within sight of the discovery, and that it is a matter of wonder that they should not have laid hold of it.

The outlines of the old Greek or Etruscan vases are merely fallacious appearances.

The old Greek and Roman paintings on walls and stones are either painted in distemper and fresco, or they have not been sufficiently examined.

The oil used in the coarser wax and wall paintings, proves at most that experiments had been tried with oils; but we have no direct proofs of oil painting having been understood or used by the Egyptians, Greeks, or Romans; and that, however great their skill or ingenuity, they might very well have been within sight and reach of the discovery, and nevertheless have missed it.

The art of painting was revived in Europe about the end of the 13th or beginning of the 14th century. The human mind, however, plunged in profound ignorance, was destitute of every principle of sound philosophy which might enable it to determine on the objects of the arts; and of consequence the painters contented themselves with works adapted to the general taste, without beauty and without proportion. In Italy, where the first attempts were made, they were employed in representing the mysteries of the passion, and subjects of a similar nature, on the walls of chapels and churches. Their labours were directed to a vast number of figures, rather than to the beauty and perfection of each; and the art in more modern times has always preserved somewhat of this absurd fault which it contracted at that early period. The artist in our times is not, like those in Greece, at liberty to devote his talents only to men of knowledge and discernment; he is constrained to please those who are rich, and very frequently those who are ignorant. Instead of proposing to himself the perfection of the art as the great object of his pursuit, he must rest his success and character on the facility of his operation and the abundance of his works.

Painting did not long continue in the imperfect condition in which it was left by those who first cultivated it among the moderns. It was natural that their successors should endeavour to surpass them by joining some degree of theory to the barbarous practice they had adopted. The first thing which they discovered, or rather which they revived after the manner of the ancients, was perspective. This made the artists capable of expressing what is called foreshortening, and of giving more effect and more truth to their works.

Dominique Ghirlandaio, a Florentine, was the first who enriched the style of his composition by grouping his figures, and who gave depth to his pictures, by distinguishing, by exact gradations, the spaces which his figures occupied; but his successors have far surpassed him in boldness of composition.

Leonard da Vinci, Michael Angelo, Giorgion, Titian, Bartholemew de St. Marc, and Raphael, flourished about the end of the 14th century. Leonard da Vinci was the inventor of a great many details in the art: Michael Angelo, by studying the ancients, and by his knowledge of anatomy, arrived at great elegance in drawing the outlines of his figures; Giorgion enriched the art

in general, and gave greater brilliancy to his colours than his predecessors: Titian, by a careful imitation of nature, made great proficiency in the truth and perfection of his tones: Bartholemew de St. Marc studied particularly the part of drapery, and discovered the claro-obscuro, the best manner of giving drapery to his figures, and of making the naked to be felt even where they were covered: Raphael, endowed with a superior genius, began with studying carefully all his predecessors and all his contemporaries. He united in himself all the excellencies which they possessed; and formed a style more perfect and more universal than any painter who went before or who has succeeded him. But while he excelled in every part of the art, he was chiefly superior in those of invention and of composition. It is probable that the Greeks themselves would have been filled with admiration if they had beheld his chief pieces in the Vatican, where to the greatest abundance of paintings is joined so much perfection, and purity, and ease.

After painting had arrived at the greatest perfection among the Greeks by the exertions of Zeuxis and Parrhasius, Apelles found nothing to add to the art except grace; in the same manner among the moderns, after Raphael had appeared, grace was the only thing wanting to the art, and Corregio became the Apelles of Europe. Painting was by him carried to the highest degree among the moderns; the taste of the best critics and the eye of the vulgar were equally gratified.

After these great masters a considerable interval elapsed till the time of the Caracci. Those artists, born at Bologna, by studying the works of their predecessors with great care, and particularly those of Corregio, became the first and the most celebrated of their imitators. Hannibal possessed a very correct design, and united somewhat of the ancient style to that of Lewis his brother; but he neglected to inquire into the intricate principles and philosophy of the art. The pupils of the Caracci formed a school after their manner; but Guido, a painter of an easy and happy talent, formed a style altogether graceful, and rich, and easy. Guersheem formed after Caravaggio, or invented himself a particular style of the claro-obscuro, composed of strong shades and vivid oppositions.

Peter de Cortona succeeded those great imitators of their predecessors and of nature; who finding it difficult to succeed in that kind of painting, and having besides great natural abilities, applied himself chiefly to composition or arrangement, and to what the artists call taste. He distinguished invention from composition; appeared not to have attended to the former, but chiefly to those parts which are most prominent in the picture, and to the contrasting of groups. It was then that the practice was introduced of loading pictures with a great number of figures, without examining whether or not they agreed to the subject of the history. The ancient Greeks employed a very small number of figures in their works, in order to make the perfection of those which they admitted more evident. The disciples or imitators of Cortona, on the other hand, have sought to conceal their imperfections by multiplying their figures. This school of Cortona is divided into many branches, and has changed the character of the art. The multiplication of figures, without a judicious and proper choice, carried back the art of painting to that point where the first restorers of it among the moderns had left it; while at the same time the

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disciples of Cortona were enabled to give to this first condition of the art a greater degree of perfection than the first artists.

About the middle of the 17th century flourished at Rome Carlo Maratti, who, aiming at the greatest perfection, carefully studied the works of the first painters, and particularly those of the school of the Caracci. Although he had already studied nature, he discovered by the works of these artists that it is not always proper to imitate her with a scrupulous exactness. This principle, which he extended to every part of the art, gave to his school a certain style of carefulness, which however is considerably degenerated.

France has also produced great masters, particularly in the part of composition; in which Poussin, after Raphael, is the best imitator of the style of the ancient Greeks. Charles le Brun and many others distinguished themselves for great fertility of genius; and as long as the French school departed not from the principles of the Italian school, it produced masters of great merit in the different branches of the art.

Mengs, from whom this account is taken, is not deceived when he declares the art of painting to have degenerated in France after Le Brun; but he seems to be mistaken in giving the imitation of the works of Rubens found at Paris as the cause of this decay. It appears from this opinion, that the recent French school was not well known to him. The French, indeed, if we may believe their own authors, were never much occupied in the imitation of Rubens; and they have for a long time despised him. But the perfection of the dramatic art in France, the dress of their actors, the magnificence and manners of the court, have contributed very much to the decay of painting. Instead of forming their taste on the beautiful simplicity of nature, their painters studied the gestures and the attitudes of comedians, the fopperies of women of fashion, the affected airs of courtiers, the pageantry of Versailles, and the magnificence of the opera. Mengs says, "that the French have formed a national style, of which ingenuity and what they call *esprit* are the discriminating qualities; that they have ceased to introduce Greek, Egyptian, Roman, or barbarian personages into their paintings; and that, after the example of Poussin, they content themselves with figures altogether French, as if it were their intention to hand down to posterity that such a nation once existed."

Since, according to the confession of Mengs, their figures are altogether French, there is no reason to believe that the French painters have imitated Rubens, whose works are marked much more strongly than those of his master Æneus with the Flemish character. The truth is, that their painters, like Cortona and Maratti, have crowded their pictures with a great number of figures; have grouped them in a manner most calculated to strike the senses; have been more intent on agreeable artifices than expression and beauty; and, finally, that they have borrowed the manners of the court and theatre.

The first masters of the great schools of painting, with the ancients and nature for their guides, and their genius for their support, carried every part of the art to the greatest height of perfection. Those who followed them, and who had the example of their predecessors in addition to the first sources of truth and beauty, did by no means arrive at the same excellence. The Caraccis in their school, Paul Veronese, and all the painters of

his time, Vandyke, and all those who exercised the art in Italy, in Flanders, and in France, supported it with great brilliancy. But soon after the number of artists was multiplied; and slavishly copying men of inferior talents, they produced works of an inferior nature. Some wanting to be colourists, their pieces were exaggerated; others affecting simplicity, became cold and insipid. At this period of the art, men of real abilities, and covetous of fame, who wished to rise superior to the mediocrity of the times, seem not to have taken the road of truth and nature. They affected a style of pompous preparation, and annexed a kind of merit to the expert management of the pencil. The affected forms of Cortona and of his pupils, the fantastical attitudes and the poignant effects of Piazzetta, and in short the ingenious contrivances of the last masters of the French school, are decided proofs of this increasing bad taste.

It appears, that for some time past greater pains have been taken to form men for the art than to encourage those who possess the talent. In consequence of this ruinous practice, schools for drawing, very different from those formed by able painters, have been exceedingly multiplied; and these give the elements according to an uniform system, by which the mind is laid under a regular restraint at the very threshold of the profession. This evil is productive of two inconveniences; it gives middling painters, and it multiplies them to that degree, as to hasten the downfall and bring into contempt the art itself.

The particular reputation of the Italian painters furnishes another reason for the decline of the art. The first painters of that country were few in number; they were honoured, and they deserved to be honoured. Their distinguished reputation has conferred a value on the general paintings of their countrymen. The desire of possessing taste, or of being thought to possess it, has led the rich and the ignorant of all nations to give a preference to the Italian market. Necessity, in this case, would multiply the painters; and their abilities must bear a pretty exact proportion to the discrimination of those who give the price.

The decline of painting has also arisen from the despotism which for some time reigned in the academic societies. In fact, these have often been ruled by men who would force every exertion of genius into their peculiar tract of operation. If they required such or such merit of execution, the first principles of the art were neglected for that peculiar excellency. In this manner the schools were absolute in behalf of design as long as statuary was held in chief estimation. The artist, whose abilities and inclination led him to colouring, was obliged to abandon a pursuit which could be of no service to him, and devote himself to that for which he was not qualified by nature. On the other hand, if the instructions of the schools be confined to colouring, a mind disposed to the choice and exactness of forms will find no encouragement, and be for ever lost to the art. In this manner the ignorance of those who wish to be connoisseurs, and the narrow views of those who pretend to direct the general taste, have equally contributed to the decline of the arts.

SECT. II. Of the Schools.

A school, in the fine arts, denominates a class of artists who have learned their art from a certain master, either by receiving his instructions, or by studying his works; and who of consequence dis-

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cover more or less of his manner, from the desire of imitation, or from the habit of adopting his principles.

All the painters which Europe has produced since the renovation of the arts are classed under the following schools: the school of Florence, the school of Rome, the school of Venice, the Lombard school, the French school, the German school, the Flemish school, the Dutch school, and the English school.

The Florence school is remarkable for greatness; for attitudes seemingly in motion; for dark severity; for an expression of strength, by which grace perhaps is excluded; and for a character of design approaching to the gigantic. The productions of this school may be considered as overcharged; but it cannot be denied that they possess an ideal majesty, which elevates human nature above mortality. The Tuscan artists, satisfied with commanding the admiration, seem to have considered the art of pleasing beneath their notice.

This school has an indisputable title to the veneration of all the lovers of the arts, as the first in Italy which cultivated them.

Painting, which had languished from the destruction of the Roman empire, was revived by Cimabue, born of a noble family in Florence in the year 1240. This painter translated the poor remains of the art from a Greek artist or two into his own country. His works, as may easily be imagined, were in a very ordinary style, but they received the applause and admiration of his fellow citizens; and if Cimabue had not found admirers, Florence in all probability would not have been honoured with Michael Angelo. The number of painters became soon so considerable in Florence, that in the year 1305 they established a society under the protection of St. Luke.

Massolino, towards the beginning of the 15th century, gave more grandeur to his figures, adjusted their dress better, and shed over them a kind of life and expression. He was surpassed by Massacio his pupil; who first gave force, animation, and relief to his works.

Andrew Castagna was the first Florentine who painted in oil. But Leonardo da Vinci and Michael Angelo, contemporary painters, were the glory of the school of Florence. Michael Angelo was superior to Leonardo in grandeur, in boldness of conception, and in knowledge of design; but Leonardo was superior to him in all the amiable parts of the art. Leonardo, possessed of a fine imagination, and full of sensibility, devoted himself in painting to express the affections of the soul; and if, in this sublime branch of the art, he was afterwards surpassed by Raphael, he had at least the glory not only of exceeding all the painters who went before him, but of pursuing a path which none of them had attempted. His design was pure and neat, and not wholly destitute of greatness. He never went beyond nature, and he made a good choice of objects for imitation.

Michael Angelo, less formed to experience sweet affections than vehement passions, sought in nature what the strength of man might accomplish, not that which constitutes beauty. He delighted in being great and terrible, more than in graceful and pleasant attitudes. Well acquainted with anatomy, he knew more exactly than any other artist in what manner to express the joining of the bones of the body, and the office and insertion of the muscles; but too eager to display his knowledge of anatomy, he seems to have forgotten that the muscles are

softened by the skin which covers them; and that they are less visible in children, in women, and in young men, than in confirmed and vigorous manhood. "In his figures (says Mengs) the articulations of the muscles are so easy and free, that they appear to be made for the attitude in which he represents them. The fleshy parts are too much rounded, and the muscles are in general too large and of too equal strength. You never perceive in his figures a muscle at rest; and although he knew admirably well how to place them, their action is very frequently inconsistent with their situation."

"He did not possess (says sir Joshua Reynolds) so many delightful parts of the art as Raphael; but those which he had acquired were of a more sublime nature. He saw in painting little more than what might be attained in sculpture; and he confined it to exactness of form and the expression of passions."

He informs us, in one of his letters, that he modelled in earth or wax all the figures which he intended to paint. This method was familiar to the great painters of his time, and ought never to be abandoned. It appears, that in representing them in this manner in relief, the painter can imitate them much more exactly than when they are drawn with a crayon or pencil on a plain surface.

"Michael Angelo (continues sir Joshua Reynolds) never attempted the lesser elegancies and graces in the art. Vasari says, he never painted but one picture in oil; and resolved never to paint another, saying it was an employment only fit for women and children.

"If any man had a right to look down upon the lower accomplishments as beneath his attention, it was certainly Michael Angelo; nor can it be thought strange, that such a mind should have slighted, or have been withheld from paying, due attention to all those graces and embellishments of art which have diffused such lustre over the works of other painters."

Ancient Rome, rich with the works brought from Greece, or finished in its own bosom by Grecian artists, handed down in its ruins the remains of that glory to which it had been elevated. It was by the study of these remains that the modern artists were formed: they derived from them the knowledge of design, the beauty of exquisite forms, greatness of style, and justness of expression, carried to that length only which did not affect the beauty of the figure. From them also they derived the principles of the art of drapery; and they followed these principles even while they made the drapery of modern paintings more large and flowing than what was practised by the ancient sculptors. The Roman school was altogether devoted to the principal parts of the art, to those which require genius and vast conceptions; and was no farther occupied with colours than what was necessary to establish a difference between painting and sculpture, or rather between painting varied with colours and in clara-obscura.

Raphael Sanzio, born at Urbino in 1483, and scholar to Pietro Perugino, was the undoubted founder of this school. His first manner was that of Perugino his master; but he travelled twice to Florence to study the great artists who flourished in that city.

It was fortunate for Raphael, says Mengs, that he was born in what he terms the infancy of the art, and that he formed himself by copying nature

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before he had access to see the works of any great master. He began by studying, with great exactness, the simple truth in his figures. He was then ignorant that any choice was necessary; but he saw the works of Leonardo da Vinci, of Massacio, and of Michael Angelo, which gave his genius a new direction. After this he perceived that there was something more in the art of painting than a simple imitation of truth. But the works of those masters were not sufficiently perfect to point out the best choice to make; and he continued in uncertainty till he saw at Rome the works of the ancients. Then he perceived that he had found the true models which he wanted; and in imitating them he had only to follow the natural impulse of his genius.

Habituated by his first manner to imitate nature with precision, it was not difficult to carry the same exactness into the imitation of the ancients; and it was a great advantage to him that he flourished in an age wherein the artists were not arrived at facility of execution at the expence of rigorous exactness. He never lost sight of nature; but he was instructed by the ancients in what manner she should be studied. He perceived, that the Greeks had not entered into minute details, that they had selected what was great or beautiful, and that one of the chief causes of the beauty of their works was the regularity of their proportions: he began, therefore, by carefully studying this part of the art. He saw also that the joinings of the bones, and the free play of their articulations, are the causes of all graceful movement: he therefore, after the example of the ancients, gave the greatest attention to this part, and was led by these observations not to be contented with the simple imitation of nature.

His design is excellent, but neither so perfect nor so finished as that of the Greeks. He excelled in representing the character of philosophers, apostles, and other figures of that kind; but he did not equal the Greeks in ideal figures, which ought to carry the impression of divinity. His taste for design was more Roman than Greek, because he formed it chiefly on the basso-relievos which he found at Rome. On this account he had the habit of marking strongly the bones and the articulations, and labouring the fleshy parts less; but as these basso-relievos are very exact with regard to the reciprocal proportions of every member, he excelled in this part, while at the same time he did not give to his figures all the elegance of the Greek artists, nor the flexibility of articulation which is admired in the Laocoon, in the Apollo of Belvidere, and in the Gladiator.

The manners and spirit of his age, and the subjects which he most commonly treated, prevented him from reaching the ideal of the ancients. Having seldom occasion to represent figures altogether ideal, he devoted himself to purity of expression. He knew that the expression of the passions of the soul is absolutely necessary in an art which represents the actions of men, since from those affections the actions may be said truly to originate. To make figures act, and yet neglect the interior springs of action, is nothing more than a representation of automata. The attitudes and action are evident; but they appear not to act of themselves, because they are void of those principles from which alone men are supposed to act. An artist who neglects expression, gives no just representation of character, even though he should take nature for his model.

Raphael's first care, when he wanted to com-

pose a piece, was to weigh the expression; that is to say, to establish, according to the nature of the subject, the passions which were to animate the characters. All the figures, all the accessories, all the parts of the composition, were moulded to the general expression.

As he had not found examples in the ancient statues of the *claro-obscuro*, he was comparatively weak in this part; and if there was any thing remarkable in his distribution of light and shade, he owed it to the works of the Florentine painters. It cannot be said, however, even with regard to the *claro-obscuro*, that he imitated nature without taste. He delighted in what are called masses of light; and disposed the great lights in the most conspicuous places of his figures, whether naked or in drapery. If this method did not produce effects highly illusive, it gives his works that distinctness which makes his figures conspicuous at a distance; and this must be allowed to be an essential part of the art of painting. He did not proceed beyond this; and content with that kind of *claro-obscuro* which comprehends imitation, he never attempted that which is ideal.

The composition and the ensemble of his figures were the chief excellences of Raphael. His philosophical mind could not be affected with objects which had not expression. He had too high an idea of painting to consider it as a mute art; he made it speak to the heart and soul; and he could only do this in subjects which required expression. If Raphael did not reach the Greek excellence, if he did not possess the art of embellishing nature in the same high degree, he saw at least, and imitated her in whatever was expressive and beautiful. "The Greeks sailed with majesty," says Mengs, "between earth and heaven: Raphael walked with propriety on the earth."

"Composition is in general," says the same author, "of two kinds: Raphael's is the expressive kind; the other is the theatrical or picturesque, which consists of an agreeable disposition of the figures. Lanfranc was the inventor of this last, and after him Pietro de Cortona. I give the preference to Raphael; because reason presides over all his works, or at least the greatest part of them. He never allowed himself in common ideas, and was never allured to give any thing in his accessory figures, which might turn the attention from the principal object of the piece."

A history of the schools is nothing more than a history of the painters who founded them. In those two which we have already given, Michael Angelo and Raphael come readily forward to claim our attention; and therefore we cannot do better than conclude the account by the masterly contrast of these eminent painters given by sir Joshua Reynolds. "If we put those great artists," says he, "in a light of comparison with each other, Raphael had more taste and fancy, Michael Angelo more genius and imagination. The one excelled in beauty, the other in energy. Michael Angelo has more of the poetical in operation; his ideas are vast and sublime; his people are a superior order of beings; there is nothing about them, nothing in the air of their actions, or their attitudes, or the style and cast of their limbs or features, that puts one in mind of their belonging to our species. Raphael's imagination is not so elevated; his figures are not so much disjointed from our own diminutive race of beings, though his ideas are chaste, noble, and of great conformity to their subjects. Michael Angelo's works have a strong, peculiar, and mark-

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ad character; they seem to proceed from his own mind entirely; and that mind so rich and abundant, that he never needed, or seemed to disdain, to look abroad for foreign help. Raphael's materials are generally borrowed, though the noble structure is his own. The excellency of this extraordinary man lay in the propriety, beauty, and majesty of his characters; his judicious contrivance of composition, correctness of drawing, purity of taste, and the skilful accommodation of other men's conceptions to his own purpose."

This school is the child of nature. The Venetian painters, not having under their eyes like the Roman the remains of an antiquity, were destitute of the means of forming a just idea of the beauty of forms and of expression. They copied without choice the forms of nature; but they were chiefly delighted with the beauties which presented themselves in the mixture and the variety of natural colours. Their attention not being detached from this part by any thing of greater importance, colouring was their chief object, and they succeeded in it. They did not rest contented with characterizing the objects by comparison, in making the colour proper for one of more value by the colour more proper for another; but they endeavoured still farther, by the agreement and opposition of the coloured objects, and by the contrast of light and shade, to produce a vigorous effect, to demand and fix the attention. Dominic, who was said to have perished at Florence by the jealousy of Andre Castagna, and who was the second Italian artist who painted in oil, had educated, before he quitted Venice, his native country, Jacques Bellin, who was remarkable for nothing but the picturesque education which he gave to Gentel and John his two sons.

Gentel, who was the eldest, painted chiefly in water colours. John contributed much to the progress of his art in painting constantly in oil, and after nature. Although he always retained great stiffness in his manner, he had less than his father or brother. Great neatness of colouring, and an approach to harmony, are evident in his works. His taste in design is Gothic, the air of his heads is sufficiently noble, his attitudes are without judgment, and his figures without expression. He had for scholars Giorgion and Titian, who deserve to be considered as the founders of the Venetian school.

Giorgion distinguished himself by a design of a better taste than that of his master: but he chiefly surpassed him in colouring. He died in his 32d year; and excited the emulation of Titian, who soon greatly excelled him.

Tiziano Vecelli, known best by the name of Titian, was instructed to copy nature in the most servile manner in the school of John Bellin; but when he had seen the works of Giorgion, he began to study the ideal in colouring.

The truth of history is not to be expected in his historical paintings, or in those of the artists of the same school. He seems to have paid little attention to the consistence of scene, to the costume, to expression adapted to the subject, or finally, to the accommodation of parts which characterise the works of those who have studied the ancients. He was in short a great painter, and nothing more.

But although he deserves not to be placed among the most distinguished artists in point of judgment, yet he is by no means destitute of great and noble conceptions. There is often to be found among his male figures a considerable degree of

grandeur: but if he has sometimes, like Michael Angelo, overcharged his design, it was more discovered in the swelling of the soft and fleshy parts, than in vigour and muscular strength.

Almost entirely devoted to simple imitation, he had scarcely greater choice in the *claro-obscuro* than in design. He cannot be justly reproached at the same time for weakness in this particular; because in endeavouring to imitate the colours of nature, he was obliged to observe the degrees of light. And in proportion as he succeeded in the imitation of natural colours, he must be less defective in the *claro-obscuro*: but it is not in the knowledge of this part of the art that we are to seek for the beauties of his works. These are to be found in the happy dispositions of colours both proper and local, and he carries this to the highest point of perfection.

The artists in the Florentine and Roman schools painted most commonly in water colours or in fresco; and in the exercise of their profession, instead of nature, they finished their works from their first sketches. Titian painted in oil, and finished from the objects in nature; and this practice, joined to his exquisite talents, gave the greatest truth to his colours. His being a portrait painter was also of advantage to him as a colourist. In this department he was accustomed to the colours of nature in carnations and draperies. He was a landscape-painter; and here also he took the colours from nature.

"As Titian perceived," says Mengs, "that the objects which are beautiful in nature have often a bad effect in painting, he found it necessary to make a choice in the objects of imitation; and he observed, that these were objects of which the local colours were extremely beautiful, which nevertheless were in a great measure destroyed by the reflection of light, by the porosity of the body, and by different luminous tints, &c. He perceived also, that in every object there was an infinite number of half tints, which conducted to the knowledge of harmony. In short, he observed in the objects of nature a particular agreement of transparency, of opacity, of rudeness, and of polish, and that all objects differed in the degrees of their tints and their shades. It was in this diversity he sought the perfection of his art; and in the execution he moderated the effect of natural colours. For example, in a carnation which had many demi-tints, he confined himself to one; and he employed even less than a demi-tint, where there were few in the natural object. By these means he obtained a colouring exquisitely fine; and in this part he was a great master, and deserves to be carefully studied."

Titian has in general little expression in his pictures, and he sometimes introduces figures which augment the coldness of the piece; for if it be true that the heads, even in historical painting, ought to be studied after nature, it is true also that an individual nature ought not to be presented, but one general and ideal. It is necessary that they should be men, while they resemble not men we are accustomed to see. The painter fails in the effect which he ought to produce, if, when he represents Achilles, Hector, and Cæsar, his personages are familiar to our observation.

The colours of his paintings are so mingled together, as to give no idea of the colours on his pallet; which distinguishes him from Rubens, who placed his colours one at the side of another. It is impossible to say, on the narrowest inspection, with what colours he produced his tints. This

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practice, which enabled him to imitate so exactly the colours of nature, gives a marked distinction to his manner of painting. In the examination of his works, the critics lose an ordinary source of pleasure which arises from marking the freedom of hand; but they may console themselves with the natural and exquisite touches of this artist.

He is of historical painters one of those who have succeeded in landscape. His situations are well chosen; his trees are varied in their forms, and their foliage well conceived. He had a custom of representing some remarkable appearance in his landscapes to render them more striking.

The distinguishing characteristics of this school are, grace, an agreeable taste for design, without great correction, and mellowness of pencil, and a beautiful mixture of colours.

Antonio Allegri, called Corregio, was the father and greatest ornament of this school. He began like the painters of his time to imitate nature alone; but, as he was chiefly delighted with the graceful, he was careful to purify his design from all short turnings and unnecessary angles. He perceived that largeness contributed to grace; and therefore he not only rejected all small figures, but enlarged as much as possible the outlines, avoided acute angles and straight lines, and by these means gave an easy grandeur to his design. He made his figures elegant and large; he varied the outlines by frequent undulations; but he was not always pure and correct.

Corregio painted in oil, a kind of painting susceptible of the greatest delicacy and sweetness; and as his character led him to cultivate the agreeable, he gave a pleasing captivating tone to all his pictures. He sought transparent colours to represent shades conformable to nature, and adopted a manner of glazing which actually rendered his shadows more obscure. Obscurity in painting cannot be fully obtained without transparent colours; for these absorb the rays of light, and of consequence give less reflection. He laid his colours very thick on the brightest parts of his pictures, to make them capable of receiving, by a proper touch, the greatest degree of light. He perceived, that the reflections of light correspond with the colour of the body from which they are reflected; and on these principles he founded his theory of colours with respect to light and shade and reflection. But it is chiefly in the colour of his shades that he deserves to be imitated; for his lights are too clear, and somewhat heavy; and his fleshy parts are not sufficiently transparent.

Harmony and grace are connected together; and on this account Corregio excelled also in harmony. As the delicacy of his taste suffered him not to employ strong oppositions, he naturally became a great master in this part, which chiefly consists of easy gradations from one extreme to another. He was harmonious in his design, by making the lines which formed the angles of the contour arched and undulated. Both in the lights and shades, he placed always between the two extremes a space which served to unite them, and to form a passage from the one to the other. The delicacy of his organs made him perceive, better than any other artist, what relief was necessary to the eye after a violent exertion; and he was therefore careful to follow a bold and prevailing colour with a demi-tint, and to conduct the eye of the spectator, by an invisible gradation, to its ordinary state of tension. In the same manner (says Mengs) does agreeable and melting music pull one so gently out of sleep, that the awaking

resembles enchantment more than the disturbing of repose. A delicate taste in colours, a perfect knowledge of the *claro-obscuro*, the art of uniting light to light, and shade to shade, together with that of detaching the objects from the ground, inimitable, grave, and perfect harmony, were the qualities which distinguished Corregio from all the painters, and placed him near the head of his profession.

The Carracci, Lewis, Augustin, and Hannibal, formed what is called the second Lombard school, which is frequently distinguished by the name of the school of Bologna.

Lewis was the master of the other two: he had studied the works of Titian and Paul Veronese at Venice, those of Andre del Sarte at Florence, those of Corregio at Parma, and those of Jules Roman at Mantua; but he chiefly endeavoured to imitate the manner of Corregio. Hannibal fluctuated between Corregio and Titian. Augustin their rival in painting had his mind cultivated by learning, and devoted part of his time to poetry and music, to dancing and to other many exercises. These three painters often employed their talents on the same piece; and it was admirable that their united labours seemed to be animated with the same spirit.

They established an academy at Bologna, which their zeal for the advancement of their art made them call *l'Accademia degli Desiderosi*; but it was afterwards called the Academy of the Carracci, because the reputation which these artists acquired permitted not a more illustrious name to be given to an establishment of which they were the founders. In this school were taught the art of constructing models, perspective, and anatomy; lessons were given on the beautiful proportions of nature, on the best manner of using colours, and on the principles of light and shade. They held frequent conferences, in which not only artists, but men of general knowledge, were permitted to elucidate points relative to the art of painting; but they were separated upon Hannibal's going to Rome to adorn the gallery of the cardinal Farnese.

The works of the Carracci are often, from the resemblance of their manner, confounded together; especially those which were finished previous to the residence of Hannibal at Rome. Meanwhile each of them has a decided character distinct from the other two. Lewis had less fire, but more of gracefulness and grandeur: Augustin had more spirit in his conception, and more pleasantness in his execution: Hannibal is characterized by boldness, by a design more profound, by an expression more lucky, and by an execution more solid.

Sir Joshua Reynolds, who saw the works of Lewis at Bologna, holds him out in his discourses as the best model for what is called style in painting; which is the faculty of disposing colours in such a manner as to express our sentiments and ideas. "Lodovico Carracci," says he, "I mean in his best works" appears to me to approach the nearest to perfection. His unaffected breadth of light and shadow, the simplicity of colouring, which, holding its proper rank, does not draw aside the least part of the attention from the subject, and the solemn effect of that twilight which seems diffused over his pictures, appears to me to correspond with grave and dignified subjects better than the more artificial brilliancy of sunshine which enlightens the pictures of Titian."

Hannibal is esteemed by the best judges as a

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model for beauty and design. Those who blame him for becoming less a colourist at Rome than he was at Bologna, ought to recollect that it is his performances at Rome which have chiefly secured his reputation. Severe critics have maintained that his design is too little varied in his figures; that he excels only in male beauty; that in imitating ancient statues, he excites some resemblance, but without arriving at the sublimity of ideas and of style which characterize the ancients; or, in other words, that he hath successfully imitated the exterior of their manner, but that he was incapable of reaching the interior and profound reasonings which determined those admirable artists.

The success of Hannibal, and the reputation which he acquired, have been pernicious to the art. His successors, deluded by these considerations, have made him the object of their imitation, without ascending to the sources from which he derived his knowledge, and which he never could equal. The result has been, that, instead of becoming equal to Hannibal, they have often copied his imperfections.

This school has been so different under different masters, that it is difficult to characterize it. Some of its artists have been formed on the Florentine and Lombard manner, others on the Roman, others on the Venetian, and a few of them have distinguished themselves by a manner which may be called their own. In speaking in general terms of this school, it appears to have no peculiar character; and it can only be distinguished by its aptitude to imitate easily any impression; and it may be added, speaking still in general terms, that it unites, in a moderate degree, the different parts of the art, without excelling in any one of them.

It is equally difficult to determine the progress of painting in France. Miniature painting, and painting on glass, were early cultivated in that country; and in these two kinds, the Italians had often recourse to the French artists. When Francis I. encouraged Rosso, a Florentine, and Primaticci, a Bolognian, the painters in France were not remarkable for any superior talent; but they were capable of working under these foreign artists.

Cousin, a painter on glass, and portrait-painter, was the first who established any kind of reputation in France. He was correct, but possessed very little elegance of design.

Painting, for some time encouraged by Francis I. fell into a state of languor, from which it was not recovered till the reign of Louis XIII. Jacques Blanchard, formed at the Venetian school, and called the French Titian, flourished about this period. But as he died young, and without educating any pupils to perpetuate his manner, he must be regarded as a single good artist, and not as a founder of the French school.

In the same manner Poussin, one of the greatest French painters, and whom they call the Raphael of France, educated no pupils, nor formed any school. His style and character of painting are described by sir Joshua Reynolds as simple, careful, pure, and correct. No works of any modern (adds the same author) have so much of the air of antique painting as those of Poussin. His best performances have a remarkable dryness of manner, which, though by no means to be recommended for imitation, yet seems perfectly correspondent to that ancient simplicity which distinguishes his style.

In the latter part of his life he changed from this manner to one much softer and richer; where there is a greater union between the figures and the ground. His favourite subjects were ancient fables; and no painter was ever better qualified to paint such subjects, not only from his being eminently skilled in the knowledge of the ceremonies, customs, and habits of the ancients, but from his being so well acquainted with the different characters which those who invented them gave their allegorical figures.

If Poussin, in the imitation of the ancients, represents Apollo driving his chariot out of the sea by way of representing the sun rising, if he personifies lakes and rivers, it is no way offensive in him, but seems perfectly of a piece with the general air of the picture. On the contrary, if the figures which people his pictures had a modern air or countenance, if they appeared like our countrymen, if the draperies were like cloth or silk of our manufacture, if the landscape had the appearance of a modern view, how ridiculous would Apollo appear? instead of the sun, an old man; or a nymph with an urn, instead of a river or a lake.

Poussin, however, more admired than imitated, had no manner of influence in forming the French school. Simon Vouet, his enemy and persecutor, had this honour, because his pupils, in the happy age of the arts in France, conferred on it the greatest splendor. Vouet was a man of distinguished abilities; but the school which he erected would have had no continuance if his scholars had pursued his manner of painting. He had a kind of grandeur and facility; but his design was false with regard to colours, and without any idea of expression. It was said of him, that he only needed to take the pencil in his hand to finish with one stroke the subject which he had conceived; and on this account one is tempted to be pleased, because he is astonished. He had the merit of destroying the insipid manner which reigned in France, and of pointing the way to a better taste.

If Vouet laid the foundation of the French school, Le Brun finished the edifice. When Le Brun was placed under the tuition of Vouet, he astonished his master and the rest of his pupils with the rapidity of his progress. At the age of twenty-six he finished his piece called the horses of Diomedes, which gained a place in the palace royal, beside those of the most eminent painters. He was afterwards recommended to Poussin; but the young artist was more disposed by his natural inclinations to that modern part of the art which is called the great machine, than to the profound and studied manner of the Greek artists. Poussin, at the same time, was of great service to him, in recommending to his study the monuments, the customs, the dress of the ancients; their architecture, their rites, their spectacles, their exercises, their combats, and their triumphs.

Le Brun had a noble conception and a fruitful imagination. He was on no occasion inferior to the vast compositions which he undertook, and he chiefly excelled in rigorous costume and exact likenesses.

Few painters have united so great a number of essential qualities and accessories of the art; and if he had superiors, it consisted in this, that they possessed some particular quality in a more eminent degree.—He was a good drawer, but his design was far from being so elegant as that of Raphael, or so pure as that of Domenique, and it was less lively than that of Hannibal Carracci,

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whom he had taken for a model. In drapery he followed the Roman school: the clothes which he gave to his figures were not like those of the Venetian school, of such and such a stuff; they were draperies and nothing more, and this manner agreed with the heroic style of his works; but in this part he was not equal to the painter of Urbino. He had studied the expression of the affections of the soul, as is evident from his treatise on the character of the passions: but after observing the general characters, and establishing the principal strokes of expression, he thought he reached the whole extent of this subject, which is so infinitely extended. He always employed the few characters which he had once found out, and neglected to study the prodigious variety of gradations by which the interior affections are manifested in the exterior appearance. He fell then into the manner of repeating always; and possessed neither the delicacy, nor the depth, nor the extreme justness, of Raphael's expression. He loved and possessed in a high degree the grand machine of the art; he was delighted with great compositions; and he gave them life, and animation, and variety; but he wanted the vigour and inspiration of Raphael. His compositions are formed on philosophical principles, but those of Raphael are created. Le Brun thought well; Raphael, Poussin, le Sueur, thought most profoundly.—Le Brun had elevation, but he was not elevated like Raphael, to the sublime.

In colouring, Le Brun did not imitate the painters of the Venetian school. The sweet attractions and strong and solid colours of the schools of Rome and Lombardy seem rather to have been the object of his imitation; and from them also he learned an easy, agreeable, and bold management of the pencil.

As Le Brun possessed a great share of lively imagination, he delighted in allegory, which gives the greatest scope for ingenious invention. The fecundity and resources of his imagination appeared still farther, in his inventing symbols for his allegorical figures without resting contented with those employed by the ancients. But fanciful representations of this kind are distant from the operations of true genius. Spirit and thought in the arts are very different from spirit and thought in literary productions. A painter of moderate abilities may introduce into his works a great deal of the invention which belongs to poetry without enriching his peculiar art. The true spirit of painting consists in making the figures appear in the very circumstances and attitudes in which they are supposed to act, and penetrated with the sentiments with which they ought to be affected. By these means the spectator is more certainly interested than if the actions and thoughts were represented by allegorical symbols. Poussin appears to have less waste of spirit and imagination than Le Brun, while at the same time he gives more delight to people of spirit and imagination.

Eustach le Sueur was the contemporary and rival of Le Brun; and no painter approached nearer to Raphael in the art of drapery, and in disposing the folds in the most artful and the noblest manner. His design was in general more slender than that of Raphael, but, like his, it was formed on the model of the ancients. Like Raphael, he represented with art and precision the affections of the soul; like him, he varied the hair of the head, according to the condition, the age, and the character of his personages; and, like him, he made the different parts of every figure contribute to the general effect. His intention in composing was to

express his subject, not to make shining contrasts or beautiful groups of figures, not to astonish and bewitch the spectator by the deceitful pomp of a theatrical scene, or the splendor of the great machine. His tones are delicate, his tints harmonious, and his colours, though not so attractive as those of the schools of Venice and Flanders, are yet engaging. They steal peaceably on the soul, and fix it without distraction on the parts of the art, superior to that of colouring.

His preaching of St. Paul, and the picture which he painted at St. Gervais, which the critics compare with the best productions of the Roman school, and the 22 pictures which he painted for the Carthusian monastery at Paris, and which were lately in possession of the king, are esteemed his best pieces. His contemporaries affirm, that he considered as sketches merely those excellent performances which are the glory of the French school.

If Le Sueur had lived longer, or if, like Le Brun, he had been employed under a court, fond of the arts and of learning, to execute the great works of the age, the French school would have adopted a different and a better manner. The noble beauty of his heads, the simple majesty of his draperies, the lightness of his design, the propriety of his expression and attitudes, and the simplicity of his general disposition, would have formed the character of this school. The deceitful pomp of theatrical decoration would have been more lately introduced, or perhaps would never have appeared, and Paris might have been the counterpart to Rome. But as Le Brun, by an accidental concurrence of favourable circumstances, was the fashionable painter, to be employed or rewarded it was necessary to imitate his manner; and as his imitators possessed not his genius, his faults became not only current but more deformed.

The French school not long ago changed its principles; and if, when peace shall be restored to that nation, they continue to follow the road which, while the arts flourished among them, they marked out for themselves, they have the chance of becoming the most rigid observers of the laws imposed on the Greek artists. The count de Ceyles, pupil of Bouchardon, who by his rank and fortune had the means of encouraging the imitators of the ancients, and of the masters of the 15th century, first formed the design of restoring a pure taste to the art of painting. He was seconded by the talents of M. Vien, an artist who had only occasion to have his lessons and his example laid before him. In this manner commenced a revolution, so much the more wonderful, as it was scarcely ever known that any nation substituted a system of simple and rigid excellence in place of a false and glittering taste. The history of all nations, on the contrary, discovers a gradual progress from a rude beginning to perfection, and afterwards to irremediable decay. The French had the prospect of stopping short in this ordinary course. They began in a manner which promised success; and the best consequences may be expected, if the internal commotions of France do not destroy the taste for the arts in that country.

In Germany there can hardly be said to be a school, as it is a continuation of single artists, who derived their manner from different sources of originality and imitation. There were some German painters of eminence, when the art, emerging from its barbarous state, first began to be cultivated with success in Europe. As they were totally unacquainted with the ancients, and had scarcely access to the works of their contemporaries in Italy, they

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copied nature alone, with the exception of somewhat of that stiffness which forms the Gothic manner. It is in this manner, if we speak of the early German painters, which characterizes their school. But this is by no means the case with their successors, part of whom were educated in Flanders and part in Italy: for if Mengs or Dietrich were comprehended in this school, there would be nothing peculiar to its manner discovered in their works. And it is therefore necessary to confine our observations to the more ancient German painters, in whom the Gothic style is conspicuous.

Albert Durer was the first German who corrected the bad taste of his countrymen. He excelled in engraving as well as painting. His genius was fertile, his compositions varied, his thoughts ingenious, and his colours brilliant. His works, though numerous, were finished with great exactness; but as he owed every thing to his genius, and as works of inferior merit were by the false taste of the times preferred to his, it was impossible for him altogether to avoid the faults of his predecessors. He is blamed for stiffness and aridity in his outlines, for little taste or grandeur in his expression, for ignorance of the costume, of aerial perspective, and of gradation of colours; but he had carefully studied lineal perspective, architecture, and fortification.

John Holbein or Holbein, nearly contemporary with Albert Durer, painted in oil and water colours. He excelled chiefly in history and in portrait painting. His colours are fresh and brilliant, and his works are highly finished; but in his historical subjects, his draperies are not in so good a taste as those of Albert Durer.

The Flemish school is recommended to the lovers of the art by the discovery, or at least the first practice of oil painting. Van Mander gives us the account of this wonderful discovery in the following words: "John Van Eyck was so excellent a chemist, that he discovered a method of varnishing his distemper colours with a varnish, which was made of some oils, and was very pleasing on account of the gloss and lustre it gave them. Many artists in Italy had vainly attempted to find out that secret; they never hit on the true method. It happened once that John, in his usual manner, having highly finished one of his pictures on boards, and having varnished it with his new invented varnish, exposed it to dry in the sun; but whether the boards were not well joined, or whether the heat of the sun was too violent, the boards split asunder and opened in the junctures. John saw with concern that his work was spoiled, and resolved to contrive something against future accidents of the same kind. Being disgusted at distemper painting and varnishing, he thought of a varnish that might dry without sunshine; and having tried many oils and substances, he found that linseed and nut oil dried better than any other. He boiled them with some other drugs, and produced far the best varnish then known. Ever bent on improvement, he found, after much enquiry, that colours mixed with these oils worked and dried extremely well, and when dried would be waterproof. He observed likewise, that these oils would animate and give them a gloss and lustre without any farther varnishing." The truth, however, of this account is now very much questioned; and it is even proved by the manuscripts of Theophilus Presbyter, and also by some old oil paintings in England, that this method of painting was discovered long before the time of John Van Eyck. At the same time we admit, that John and his brother

Hubert may have been the first who brought off painting into general practice, not only by showing the excellence of which it was susceptible, but also by making several improvements on the art. And this is the more probable, from the great reputation which their pictures acquired over all Europe, by the softness and delicacy of their colours. The attention of the Italian painters was chiefly excited, inasmuch that Antoine de Messina performed a journey into Flanders for the express purpose of acquiring the confidence of John Van Eyck, and of discovering the secret.

John de Bruges was the founder of painting as a profession in Flanders; Peter Paul Rubens was the founder of the art. This extraordinary person produced an immense number of works. He excelled equally in historical, portrait, and landscape painting; in fruits, flowers, and in animals. He both invented and executed with the greatest facility; and to show the extent of his powers, he frequently made a great number of sketches of the same subject altogether different, without allowing any time to elapse between them. The works of Rubens were destitute of that soft inspiration, productive of sweet and pleasant effects, so conspicuous in the works of Raphael; but he possessed that sprightliness of genius and strength of mind which is ever ready to burst forth in wonderful and astonishing effects. His figures appear to be the exact counter-part of his conceptions, and their creation nothing more than a simple act of the will.

His talent for design is unjustly censured, for on every occasion his design is noble and easy. He had great knowledge of anatomy, but he was hurried away by the impetuosity of his imagination and the ardor for execution; he preferred splendour to the beauty of forms, and sacrificed correctness of design too often to the magic of colours. In short, his qualities suppose a mind full of fire and vigour, rather than accuracy or profound thought. His drapery may be considered rather as fine than properly adapted to his figures: for, in the language of the art, to clothe and to give drapery are not synonymous terms. A portrait painter may excel in clothing his personages, while he is totally incapable of giving good drapery to an historical painting. His chief merit consists in colouring; though in this branch of the art he has not equalled Titian. He is the first among painters eminent for pomp and majesty; the first among those who speak to the eye, and the power of the art is often carried by him almost to enchantment.

It is evident from the works of Rubens, that his method of painting was to lay the colours in their place, one at the side of another, and mix them afterwards by a slight touch of the pencil. Titian mingled his tints as they are in nature, in such a manner as to make it impossible to discover where they began or terminated; the effect is evident, the labour is concealed. Thus Rubens is more dazzling and Titian more harmonious. In this part, the first excites the attention, the second fixes it. The carnations of Titian resemble the blush of nature; those of Rubens are brilliant and polished like satin, and sometimes his tints are so strong and separated as to appear like spots.

"Rubens (says Sir Joshua Reynolds) is a remarkable instance of the same mind being seen in all the various parts of the art. The whole is so much of a piece, that one can scarce be brought to believe but that if any one of them had been more correct and perfect, his works would not be so complete as they appear. If we should allow a greater purity and correctness of drawing, his want of sim-

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licity in composition, colouring, and drapery, would appear more gross."

In his composition his art is too apparent. His figures have expression and act with energy, but without simplicity or dignity. His colouring, in which he is eminently skilled, is notwithstanding too much of what we call tinted: Throughout the whole of his works there is a proportionable want of that nicety of distinction and elegance of mind which is required in the higher walks of painting; and to this want it may be in some degree ascribed, that those qualities which make the excellency of this subordinate style appear in him with their greatest lustre. Indeed the facility with which he invented, the richness of his composition, the luxuriant harmony and brilliancy of his colouring, so dazzle the eye, that whilst his works continue before us, we cannot help thinking that all his deficiencies are fully supplied.

The Flemish school, of which Rubens is the greatest master, is remarkable for great brilliancy of colours and the magic of the *claro-obscuro*. To these may be joined a profound design, which is yet not founded on the most beautiful forms; a composition possessed of grandeur, a certain air of nobleness in the figures, strong and natural expressions; in short, a kind of national beauty, which is neither copied from the ancients nor from the Roman nor Lombard schools, but which deserves to please, and is capable of pleasing.

To speak in general terms, and without regarding a great number of exceptions, the Dutch school carries none of the above qualities to great perfection, except that of colouring. Far from excelling in the beauty of heads and forms, they seem chiefly to delight in the exact imitation of the lowest and most ignoble. Their subjects are derived from the tavern, the smith's shop, and from the vulgar amusements of the rudest peasants. The expressions are sufficiently marked; but it is the expression of passions which debase instead of ennobling human nature. One would think that they practised the art of degrading the bodies and souls of men.

It must be acknowledged, at the same time, that the Dutch painters have succeeded in several branches of the art. If they have chosen low objects of imitation, they have represented them with great exactness; and truth must always please. If they have not succeeded in the most difficult parts of the *claro-obscuro*, they at least excel in the most striking, such as in light confined in a narrow space, light illuminated by the moon or by torches, and the light of a smith's forge. The Dutch understand the gradations of colours; and by their knowledge of contrast they have arrived at the art of painting light itself. They have no rivals in landscape painting, considered as the faithful representation or picture of a particular scene; but they are far from equalling Titian, Poussin, Claude Lorrain, &c. who have carried to the greatest perfection the ideal landscape, and whose pictures, instead of being the topographical representation of certain places, are the combined result of every thing beautiful in their imagination or in nature. The Dutch, however, distinguish themselves by their perspective, by their clouds, sea-scenes, animals, fruits, flowers, and insects; and they excel in miniature painting. In short, every thing which requires a faithful imitation, colour, and a nice pencil, is well executed by the Dutch painters.

Holland has also produced history painters, as Octavius Van Been, and Vander Hilst, the rival of Vandyke, and perhaps his superior; but it is

not in the works of those artists that we find the character of the Dutch school.

Neither is the origin of their style to be derived from the works of Lucas of Leyden, though, from the time he flourished, viz. about the end of the 15th century, he may be considered as the patriarch of the Dutch school. Lucas painted in oil, in water colours, and on glass; and the kinds of his painting were history, landscape, and portrait. His picture of the Last Judgment is preserved in the Hotel-de-ville of Leyden; it possesses vast merit in point of composition, and a great variety of figures.

If miniature painting be considered as a characteristic of the Dutch school, Cornelius Pölenbourg may be regarded as the father of it. He possessed the colour, delicacy of touch, and disposition of the *claro-obscuro*, which chiefly distinguish this school; and if any thing is to be added, it is want of correctness in his design.

But if the choice of low figures is its chief characteristic, this is to be found in the greatest perfection in the works of the celebrated Rembrandt Vanryn; and it is the more offensive in this artist, as his compositions frequently required an opposite choice of figures. As his father was a miller near Leyden, his education must altogether have depended on the exertion of great talents and the study of nature. He studied the grotesque figure of a Dutch peasant, or the servant of an inn, with as much application as the greatest masters of Italy would have studied the Apollo of Belvidere, or the Venus de Medicis. This was not the manner of elevating himself to the noble conceptions of Raphael; but it was acquiring the imitation of truth in vulgar painting.

"Rembrandt (says M. Descamps) may be compared to the great artists for colour and delicacy of touch and *claro-obscuro*. It appears that he would have discovered the art, though he had been the first person that ever attempted it. He formed to himself rules and a method of colouring, together with the mixture of colours and the effect of the different tones. He delighted in the great oppositions of light and shade; and he seems to have been chiefly attentive to this branch of the art. His workshop was occasionally made dark, and he received the light by a hole, which fell as he chose to direct it on the place which he desired to be enlightened. On particular occasions he passed behind his model a piece of cloth of the same colour with the ground he wanted; and this piece of cloth receiving the same ray which enlightened the head, marked the difference in a sensible manner, and allowed the painter the power of augmenting it according to his principles.

"Rembrandt's manner of painting is a kind of magic. No artist knew better the effects of different colours mingled together, nor could better distinguish those which did not agree from those which did. He placed every tone in its place with so much exactness and harmony, that he needed not to mix them, and so destroy what may be called the flower and freshness of the colours. He made the first draught of his pictures with great precision, and with a mixture of colours altogether particular: he proceeded on his first sketch with a vigorous application, and sometimes loaded his lights with so great a quantity of colour, that he seemed to model rather than to paint. One of his heads is said to have a nose nearly as much projected as the natural nose which he copied."

Such is the power of genius, that Rembrandt, with all his faults, and they are enormous, is placed

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among the greatest artists by M. Descamps, who saw his works, and was himself an artist. It is necessary to observe, that if Rembrandt was ignorant of the essential parts of his art, or neglected them, he was yet acquainted with expression, which alone was capable of giving animation to his works. His expressions are not noble, but they are just, lively, and executed with great judgment.

John de Laer, a miniature painter, and who made choice of his subjects from common life, deserves a distinguished place in the Dutch school. He painted hunting-scenes, the attacks of robbers, public festivals, landscapes, and sea views; and he ornamented his pictures with old ruins, and enriched them with figures of men and animals. He had a correct design, and employed vigorous and lively colouring.

Van-Ostade, although born at Lubeck, Gerard Down, Metz, Miris, Wouwermans, Berghem, and the celebrated painter of flowers Van-Huysum, belonged to the Dutch school.

The greater part of the schools of which we have treated have no longer any existence. Italy alone had four schools, and there only remain at present a very few Italian artists known to foreigners. The school of Rubens is in vain sought for in Flanders. If the Dutch school still exists, it is not known beyond the precincts of Holland. Mengs a German artist has made himself famous in our days; but it was in Italy that he chiefly improved his talents and exercised his art. M. Dietrich, another German, has made himself known to strangers; but two solitary artists do not form a school.

It now only remains to speak of the art of painting in England, where it is at present making great advances towards excellence.

Painting has been cultivated in England at several periods with various success. We shall here give the account of it from Mr. West's letter in the third number of *Academic Annals*, published by the Royal Academy of London.

"Many sovereigns of this country have noticed and patronized the fine arts. Edward the Third caused several chapels to be embellished with painted glass and enamelled monuments, as well as with paintings on the walls, representing scriptural subjects, and others from the church legends, together with portraits of then existing characters of both sexes. The chapel of St. Stephen, Westminster, was the most conspicuous.

"Henry the Seventh gave patronage to many ingenious men, both in painting, sculpture, and architecture.

"Henry the Eighth followed the example of his father, in giving patronage to eminent men. He invited those of the greatest celebrity in painting in Italy, Germany, and Flanders, to visit his capital. Raphael and Titian he wished to see at his court; and he endeavoured to draw them thither by the most splendid offers: but not succeeding in his desire, he procured several of their works; in particular the picture of St. George, by Raphael, at present in the possession of the king of Spain, and the two pictures by Titian, now in the gallery of the marquis of Stafford; the subjects of which are, Diana and Acteon, and Diana and Calisto. He was more fortunate in his invitation to Holbein, at that time famous as a portrait painter, who resided in Henry's palace, and whose works were soon spread through the kingdom.

"Charles the First, more attached to the fine arts than any of his predecessors, formed a splen-

did collection of the works of the great Italian and Flemish masters. He invited to his court Rubens and Vandyke, and other painters of considerable eminence, from Flanders and Holland; and he gloried in counting among his natural subjects Inigo Jones, his architect, and Dobson, who rose to eminence in painting. These were the two first English artists who enjoyed the patronage of royal favour.

"Charles the Second was proud to follow the liberal example of his father, in bestowing rewards on ingenious artists. He patronized most of those who visited his court from Italy, Flanders, Germany, and Holland; of which the decorative paintings on the walls in Windsor-castle, and the palace of Hampton-court, by Verrio, and others, are evident proofs; beside many pictures from poetical subjects, by Gennari, as well as portraits by several painters of considerable eminence. The favours which this monarch showered on the arts were, however, confined to foreign artists.

"Queen Anne was the first of our sovereigns who called into activity the British pencil, as the paintings in the cathedral of St. Paul's and the hospital at Greenwich, by sir James Thornhill, and others under his direction, sufficiently evince. In architecture, sir Christopher Wren was equally distinguished by her favour.

"But to form the great epocha of patronage conferred by a British king on British subjects, in painting, sculpture, and architecture, was reserved for the reign of his present Majesty, George the Third.

"In the year 1768, his majesty gave his royal sanction to a plan formed for the establishment of an academy of painting, sculpture, and architecture, of which he was graciously pleased to become the protector and patron.

"In the three branches of art which constitute that academy, he found many artists already formed: among others of considerable celebrity in painting, Reynolds, Wilson, Hayman, Gainsborough, Hoare, Danu, Mortimer, Barret, Sandby, Wright, Cotes, and West; in sculpture, Bacon, Nollekens, and Wilton; in architecture, Chambers, G. Dance, Stuart, T. Sandby, Gwyn, and the two Adams.

"At the same time, Strange, Woollett, Hall, Green, and Mac Ardell, shone with marked eminence among the engravers. The merits of our engravers, blended with the labours of the painter, opened a new avenue to fame. The harmonious softness of Strange; the united skill of Wilson and Woollett in landscape, as seen in the prints of Niobe, Phaeton, Ceyx, Celadon and Amelia, &c.; the portraits in mezzotint from sir Joshua Reynolds, by M'Ardell, Fisher, &c.; the successful combination of West with Earlom, Green, Woollett, Hall, &c. in historical works, as seen in the prints of Agrippina, Regulus, Hannibal, Wolfe, La Hogue, the Boyne, Penn, Cromwell, and the Restoration, &c. spread the celebrity of English works of art through the medium of engraving; and the circumstance of these prints rising to a higher price in every market throughout the continent than had ever been known in the annals of the arts, inspired those commercial views which afterwards produced the galleries of Shakspeare, under Boydell; the poets, under Macklin; historical, under Bowyer, &c. &c.; giving to this country a new source of commerce, highly beneficial to its interests, and unexampled in any other."

English school.—To the list of painters mentioned by West, are to be added several who unfortunately experienced no royal patronage.—Among these is Hogarth, whose unrivalled excellence in works of humour is principally known to us by the numerous engravings from his pictures.

Of the modern English school sir Joshua Reynolds was the founder, and his works still remain its greatest glory. They not only give him the most distinguished rank among the artists of the present age, but the effects produced by them on the rising artists, as well as by the elevated principles inculcated in his discourses delivered at the Royal Academy, will secure his reputation as long as England shall pay respect to superior talents. The English taste appears to be formed on the great masters, of the Italian and Flemish schools. Reynolds professed an admiration and preference of Michael Angelo, but his own works are in no point similar to that great master of design.

The names of Gainsborough and Wilson stand the highest in landscape painting.

The painters of this school have been distinguished as less rigid with regard to the forms and correctness of their drawing, than ambitious of striking and poignant effect. "Beauty," says the French Encyclopædia, "ought to be the characteristic of the English school, because the artists have it so frequently displayed before their eyes. If this beauty is not precisely similar to the antique, it is not inferior to it."

"The English school should also be distinguished for the truth of expression, because the liberty enjoyed in that country gives to every passion its natural and unbiassed operation."

The best accounts of painting and painters are to be found in the works of Leonardo da Vinci, Alberti, Lomazzo, and Bellori; and in the Lives of the Painters, by Vasari and Du Piles; Felibien's *Entretiens sur les Vies des Peintres*, and his other writings; the Discourses delivered by Reynolds in the Royal Academy of London; the various Treatises by Mengs; Richardson on Painting; and *De Arte Graphica*, by Du Fresnoy.

The later publications of Barry, Shee in his *Rhymes on Art*, and Howe in his *Inquiry into the present State of the Arts in England*, convey the most accurate information concerning the progress of painting in this country.

PAINTURE. *s. (peinture, Fr.)* The art of painting (*Dryden*).

PAIR. *s. (paire, Fr. par, Lat.)* 1. Two things suiting one another: as, a pair of gloves. 2. A man and wife (*Milton*). 3. Two of a sort; a couple; a brace (*Ray*).

PAIR. *Jugum.* In botany, applied to the leaflets in pinnate leaves; which are said to be bijugate, trijugate, &c. from having two, three, &c. pairs of leaflets. Two-paired, three-paired, &c.

To PAIR. v. n. (from the noun.) 1. To be joined in pairs; to couple (*Shakspeare*). 2. To suit; to fit as a counterpart (*Shakspeare*).

To PAIR. v. a. 1. To join in couples (*Dryden*). 2. To unite as correspondent or opposite (*Pope*).

PAIRING, the uniting or joining in couples. The instinct of pairing is bestowed on every species of animals to which it is necessary for rearing their young; and on no other species.

Pal. All wild birds pair; but with a remarkable difference between such as place their nests on trees and such as place them on the ground. The young of the former, being hatched blind, and without feathers, require the nursing care of both parents till they be able to fly. The male feeds his mate on the nest, and cheers her with a song. As soon as the young are hatched, singing yields to a more necessary occupation, that of providing food for a numerous issue; a task that requires the exertions of both parents.

Eagles and other birds of prey build on trees, or on other inaccessible spots. They not only pair, but continue in pairs all the year round; and the same pair procreates year after year. This at least is the case of eagles: the male and female hunt together, unless during incubation, at which time the female is fed by the male. A greater number than a single pair are never seen in company.

Gregarious birds pair in order probably to prevent discord in a society confined to a narrow space. This is the case particularly of pigeons and rooks. The male and female sit on the eggs alternately, and divide the care of feeding their young.

Partridges, plovers, pheasants, sea-fowl, grouse, and other kinds that place their nests on the ground, have the instinct of pairing; but differ from such as build on trees in the following particular, that after the female is impregnated, she completes her task without needing any help from the male. See **ORNITHOLOGY**.

PAISHAWUR, a city of Hindustan Proper, capital of a district in the country of Cabul. It is situate on the Kameh, 125 miles S.E. of Cabul, and 170 N. of Moultan. Lon. 70. 36 E. Lat. 33. 18 N.

PAISLEY, a town in Renfrewshire, with manufactures of silk and thread gauze, and extensive cotton works. Its streets have names descriptive of the various employments of the inhabitants; such as Silk Street, Cotton Street, Lawn Street, &c. The magnificent abbey, for which it was once noted, is now partly in ruins; but there is a chapel entire, which is used as the family burial-place of the marquises of Abercorn, and is famous for a surprising echo. Paisley contains about thirty-two thousand inhabitants, but it stands on nearly as much ground as Glasgow, and is six miles W. of that city. Lon. 4. 20 W. Lat. 55. 52 N.

PAITA, a seaport of Peru, in the audience of Quito, with an excellent harbour. It has frequently been plundered by the buccaneers; and, in 1741, it was plundered and burnt, by commodore Anson, because the governor refused to ransom it. Lon. 81. 19 W. Lat. 6. 12 S.

PALACE, **PALATIUM**, a name generally given to the dwelling-houses of kings, princes, and other great personages; and taking different epithets, according to the quality of the inhabitants, as imperial palace, royal palace, pontifical palace, cardinal palace, ducal palace, episcopal palace, &c.

PALACIOS, a town of Spain, in Andalu-

sia, 12 miles S. of Seville. Lon. 5. 24 W. Lat. 37. 20 N.

PALÆMON, or **PALEMON**, a sea deity, son of Athamas and Ino. His original name was Melicerta. (See **MELICERTA**.) 2. A noted grammarian at Rome in the age of Tibertius, who made himself ridiculous by his arrogance and luxury.

PALÆSTRA, in Grecian antiquity, a public building where the youth exercised themselves in wrestling, running, playing at quoits, &c. To prevent the combatants from hurting themselves by falling, the bottom of the palæstra was covered with dust or gravel. Some will have the palæstra to be only a part of the gymnasium. Many authors imagine that the palæstra was of two kinds; the one for the exercise of the body, the other for the cultivation of the mind: but the derivation of the word seems to confine it to bodily exercise.

PALAOFOX (John de), a Spaniard, patronized by Philip II. and appointed bishop of Los Angeles, in America, with the title of judge of the administration of the three viceroyalties of the Indies. In this office, though he had to encounter the prejudices of the jesuits, he maintained his character of moderation and of benevolence towards the unfortunate natives, and was made by the king bishop of Osma, 1653. He died 1659, universally respected. He wrote the history of the siege of Fontarabia, 4to.—history of the conquest of China by the Tartars, 8vo.—sermons, and religious tracts.

PALAIS, a town of France, capital of the island of Belleisle, off the coast of Bretagne. It has a strong citadel, which stood a long siege against the English, in 1761, and then surrendered on honourable terms. Lon. 3. 2 W. Lat. 47. 18 N.

PALAIS (St.), a town and district of France, in the department of Lower Pyrenees, which, with the town and district of St. John-Pied-de-Port, forms nearly the whole of the late province of Lower Navarre. This is only a very moderate portion of the kingdom of Navarre, wrested, in 1512, from John d'Albert, by Ferdinand, king of Arragon and Castile. This portion, separated from Upper Navarre by the Pyrenees, made part of the kingdom of France, having been annexed to it by Henry IV. who held it in right of his mother, Jeanne d'Albert. St. Palais is seated on the Bidouse, 15 miles S.E. of Bayonne. Lon. 1. 4 W. Lat. 43. 21 N. See **NAVARRÉ**.

PALAMBOANG, or **PALAMBANG**, a town of Java, capital of a kingdom; seated at the E. end of the island, on the straits of Bally. Lon. 114. 0 E. Lat. 7. 10 S.

PALAMCOTTA, or **TINEVELLY**, a town of Hindustan, in the Carnatic, 410 miles S.W. of Madras. Lon. 77. 54 E. Lat. 8. 43 N.

PALAMEDIA. Screamer. In zoology, a genus of the class aves, order grallæ. Bill conic, the upper mandible hooked; nostrils oval; feet four-toed, cleft, a very small membrane connecting the toes at the root. Two species.

1. **P. cornuta**. Horned screamer. Wings with two spines at the head; front horned. Inhabits the fenny and maritime parts of South America; three feet four inches long; always found in pairs, and feeds on herbs, seeds and reptiles; makes a nest of mud shaped like an oven, and lays two eggs; when alarmed rises from the ground, with a loud and continued screaming.

2. **P. cristata**. Crested screamer. Wings unarmed; front crested.

The offensive armour of the first species is peculiarly formidable. When the wings are folded, the two spurs upon each are directed forward, and appear to be elongations of the bones of which they are formed. The upper spur, on each wing, is two inches long, bending a little upwards, and terminating in a sharp point; the lower one is not more than half an inch in length, but nearly as thick. All those protuberances are of an horny substance, and, towards the base, covered with a kind of case, like the barrel of a large pen. With this formidable apparatus of offensive armour, the screamer is the most gentle of all animals; he never attacks another bird; his depredations being confined to the worms upon which he feeds. Such fidelity and attachment do these birds display, that the male and female continue inseparably together till death; and when one of them dies, the affliction which united them, and pangs of grief for its loss partner, are long felt by the other. It is even said, that the disconsolate survivor wanders constantly around the place where its partner died, till, consumed with grief, it dies also.

The first species is about the size of a large swan. It is called by the natives kamichi. The head and upper part of the neck are covered with short bristly feathers; the rest of the plumage being longer, and of a dark brown colour mixed with a shade of green. The second species is called cariamia; it is not larger than a heron; and as we have just observed, has, instead of the horn rising from the crown of the head, a feather standing up like a crest. The whole plumage of this species is grey, covered with brown; and nearly resembles that of the falcon. The kamichi and cariamia are, by some naturalists, classed into two separate genera. In their general air and form, however, as well as in their manner of life, there is a similarity that indicates them both to belong to one tribe. They both live on marshy ground, and are supported, probably, by the same kinds of food. They are equally distinguished by the nakedness of their legs, and by their loud and piercing voice, though that of the cariamia is inferior in strength to that of the kamichi. In America, this bird is by its voice discovered by the hunters, who pursue it for its flesh, and have begun to domesticate it from the same motive.

PALAMEDES, a Grecian chief, son of Nauplius, king of Eubœa by Clymene. He was sent by the Greek princes, going to the Trojan war, to bring Ulysses to the camp,

who, to avoid the expedition, pretended insanity, and used to sow salt instead of barley in the furrows. The deceit was soon perceived by Palamedes, and to demonstrate it, he took Telemachus, his son, and put him before the plough of his father. Ulysses showed that he was not insane, by turning the plough a different way not to hurt his child. This having been discovered, Ulysses was obliged to attend the Greek princes to the war, but an immortal enmity arose between Ulysses and Palamedes. The king of Ithaca bribed one of his servants, and made him dig a hole in his master's tent, and there conceal a large sum of money. After this Ulysses forged a letter, which king Priam was supposed to have sent to Palamedes, desiring that, according to the conditions which were previously agreed upon, when he received the money, he should betray the Grecian army. This letter was carried before the Grecian princes. Palamedes was summoned, and protested his innocence, but all was in vain, the money was discovered in his tent. He was found guilty by all the army, and stoned to death. Homer is silent about the miserable fate of Palamedes. Palamedes was a learned man as well as a soldier, and according to some he completed the alphabet of Cadmus by the addition of the four letters θ , ξ , χ , ϕ , during the Trojan war. To him also is attributed the invention of dice and backgammon; and it is said that he was the first who regularly ranged an army in a line of battle, and who placed sentinels round the camp, and excited their vigilance and attention, by giving them a watch word.

PALAMOS, a strong seaport of Spain, in Catalonia, seated on the Mediterranean, 47 miles N.E. of Barcelona. Lon. 2. 58 E. Lat. 41. 58 N.

PALAMOW, a town of Hindustan Proper, in the province of Bahar, 210 miles S.S.W. of Patna. Lon. 84. 10 E. Lat. 23. 40 N.

PALA'NQUIN. *s.* A kind of covered carriage, used in the eastern countries, that is supported on the shoulders of slaves.

PALAEOS ISLANDS. See **PHILIPPINES**, New.

PA'LATABLE. *a.* (from *palate*.) Gustful; pleasing to the taste (*Philips*).

PA'LATE. *s.* (*palatum*, Latin). 1. The instrument of taste; the upper part or roof of the mouth (*Hakewill*). 2. Mental relish; intellectual taste (*Taylor*).

PALATE, in botany. Gibbositas prominens in fauce corollae. Philos. Bot. Processus labii inferioris superiora versus quo rictus occluditur. Delin. Pl. A prominence in the throat of a corol in labiate flowers; or a process of the lower lip, extending towards the upper part, by which the gape or opening is closed.

PALATI CIRCUMFLEXUS, in myology. See **CIRCUMFLEXUS**.

PALATI LEVATOR. See **LEVATOR PALATI**.

PALATI OSSA, in osteology. (from *palp*, to

hedge in, because it is staked in as it were by the teeth.) These bones are of a very irregular figure. They are placed between the ossa maxillaria superiora and the os sphenoides, at the back part of the roof of the mouth, and extend from thence to the bottom of the orbit. Each of these bones may be divided into four parts; viz. the inferior or square portion, the pterygoid process, the nasal lamella, and orbital process. The first of these, or the square part of the bone, helps to form the palate of the mouth. The upper part of its internal edge rises into a spine, which makes part of the septum narium. The pterygoid process, which is smaller above than below, is so named from its being united with the pterygoid processes of the sphenoid bone, with which it helps to form the pterygoid fossae. It is separated from the square part of the bone, and from the nasal lamella, by an oblique fossa, which, applied to such another in the os maxillare, forms a passage for a branch of the fifth pair of nerves. The nasal lamella is nothing more than a very thin bony plate, which arises from the upper side of the external edge of the square part of the bone. Its inner surface is concave, and furnished with a ridge which supports the back part of the os spongiosum inferius. Externally, it is convex, and firmly united with the maxillary bone. The orbital process is more irregular than any other part of the bone. It has a smooth surface where it helps to form the orbit; and, when viewed in its place, we see it contiguous to that part of the orbit which is formed by the os maxillare, and appearing as a small triangle at the inner extremity of the orbital process of this last mentioned bone. This fourth part of the os palati likewise helps to form the zygomatic fossa on each side, and there its surface is concave. Between this orbital process and the sphenoid bone, a hole is formed, through which an artery, vein, and nerve, are transmitted to the nostrils. The ossa palati are complete in the fœtus. They are joined to the ossa maxillaria superiora, os sphenoides, os ethmoides, ossa spongiosa inferiora, and vomer.

PALATI TENSOR. See **CIRCUMFLEXUS**.

PA'LATIC. *a.* (from *palate*.) Belonging to the palate, or roof of the mouth (*Holder*).

PALATINATE, a province or signiory possessed by a palatine.

PALATINE, or **COUNT PALATINE**, a title anciently given to all persons who had any office or employment in the prince's palace: but afterwards conferred on those delegated by princes to hold courts of justice in the provinces; and on such among the lords as had a palace, that is, a court of justice, in their own houses.

PALATINE (Counties) in England. Chester, Durham, and Lancaster, are called counties-palatine. The two former are such by prescription, or immemorial custom; or, at least as old as the Norman conquest: the latter was created by king Edward III. in favour of Henry Plantagenet, first earl and then duke

of Lancaster; whose heiress being married to John of Gaunt, the king's son, the franchise was greatly enlarged and confirmed in parliament, to honour John of Gaunt himself, whom, on the death of his father-in-law, the king had also created duke of Lancaster. Counties-palatine are so called a *palatio*; because the owners thereof, the earl of Chester, the bishop of Durham, and the duke of Lancaster, had in those counties *jura regalia*, as fully as the king hath in his palace; *regalem potestatem in omnibus*, as Bracton expresses it. They might pardon treasons, murders, and felonies; they appointed all judges and justices of the peace; all writs and indictments ran in their names, as in other counties in the king's; and all offences were said to be done against their peace, and not, as in other places, *contra pacem domini regis*. And indeed by the ancient law, in all peculiar jurisdictions, offences were said to be done against his peace in whose court they were tried; in the court-leet, *contra pacem domini*; in the court of a corporation, *contra pacem ballivorum*; in the sheriff's court or tourn, *contra pacem vicecomitis*. These palatine privileges (so similar to the regal independent jurisdictions usurped by the great barons on the continent during the weak and infant state of the first feudal kingdoms in Europe) were in all probability originally granted to the counties of Chester and Durham, because they bordered upon enemies' countries, Wales and Scotland: in order that the owners, being encouraged by so large an authority, might be the more watchful in its defence; and that the inhabitants, having justice administered at home, might not be obliged to go out of the county, and leave it open to the enemy's incursions. And upon this account also there were formerly two other counties-palatine, Pembrokeshire and Hexhamshire, the latter now united with Northumberland; but these were abolished by parliament, the former in 27 Hen. VIII. the latter in 14 Eliz. And in 27 Hen. VIII. likewise, the powers before mentioned of owners of counties-palatine were abridged; the reason for their continuance in a manner ceasing: though still all writs are witnessed in their names, and all forfeitures for treason by the common law accrue to them. Of these three, the county of Durham is now the only one remaining in the hands of a subject.

The Isle of Ely is sometimes called a county-palatine; but that is erroneous: that is only a royal franchise, the bishop exercising jurisdiction by grant of king Henry I.

PALATINUS MONS, the largest of the seven hills on which Rome was built. Upon it Romulus laid the first foundation of the capital of Italy, and there also he kept his court, as well as Tullus Hostilius, and Augustus, and all the succeeding emperors, from which circumstance the word *palatinum* has since been applied to the residence of a prince. Apollo, who was worshipped on the Palatine hill, was also called Palatinus. His temple there had been built by Augustus, who had enriched it with a library, valuable for the various collec-

tions of Greek and Latin manuscripts which it contained.

PALATO-PHARYNGEUS. *Musculus palato-pharyngeus*. Thyro-staphilinus of Douglas. Thyro-pharyngo-staphilinus of Winslow. A muscle situated at the side of the entry of the fauces. It arises by a broad beginning from the middle of the *velum pendulum palati* at the root of the uvula posteriorly, and from the tendinous expansion of the *circumflexus palati*. The fibres are collected within the posterior arch behind the tonsils, and run backwards to the top and lateral part of the pharynx, where the fibres are scattered and mixed with those of the *stylo-pharyngeus*. It is inserted into the edge of the upper and back part of the thyroid cartilage. Its use is to draw the uvula and *velum pendulum palati* downwards and backwards, and at the same time to pull the thyroid cartilage and pharynx upwards, and shorten it; with the constrictor superior pharyngis and tongue, it assists in shutting the passage into the nostrils; and in swallowing, it thrusts the food from the fauces into the pharynx.

PALATO-STAPHILINUS. See **STAPHILINUS**.

PALAVIA, in botany, a genus of the class monadelphia, order polyandria. Calyx single, five-cleft; style many-cleft; capsules numerous, collected into a head without order. Two species; natives of Lima; branching decumbent plants, with purple and purplish yellow flowers.

PALE. *a.* (*pale*, Fr. *pallidus*, Latin.) 1. Not ruddy; not fresh of colour; wan; white of look (*Shakspeare*). 2. Not high coloured; approaching to colourless transparency (*Arbutnot*). 3. Not bright; not shining; faint of lustre; dim (*Shakspeare*).

To PALE. *v. a.* (from the adjective.) To make pale (*Prior*).

PALE. *s.* (*palus*, Latin.) 1. Narrow piece of wood joined above and below to a rail, to enclose grounds (*Shakspeare*). 2. Any enclosure (*Hooker*). 3. Any district or territory (*Clarendon*). 4. The *pale* is the third and middle part of the scutcheon (*Peucham*).

To PALE. *v. a.* (from the noun.) 1. To enclose with pales (*Mortimer*). 2. To enclose; to encompass (*Shakspeare*).

PALEA. In botany, a chaff. Lamella receptaculo innata flosculos distinguens. A thin membrane, springing from the receptacle, and separating the florets, in some aggregate flowers. Hence such a receptacle is called

PALEACEOUS, or **CHAFFY**. As in *dipsacus*, *scabiosa*, &c. See **CHAFFY**.

PALEACEOUS PAPPUS. A chaffy crown or down to some seeds; as in *bidens*, *silphium*, *tagetes*, *coreopsis*, &c.

PALEARIUS (Aonius), an eminent writer, born at Veroli, near Rome. He resided near Sienna, where he instructed some pupils in the learned languages. Here he had an unfortunate quarrel with a rival in literature, and afterwards, in consequence of his able defence of a certain nobleman, against the monks, he became an object of persecution, and retired to

Lucca, and next to Milan. Here he found himself exposed to fresh persecution; he was again accused by the monks of heresy, and being carried to Rome was condemned and burnt to death, 1566. The best known of his works is his Latin poem on the immortality of the soul, 3 vols. 8vo.

PA'LEEYED. *a.* (*pale* and *eye*.) Having eyes dimmed (*Pope*).

PA'LEFACED. *a.* (*pale* and *face*.) Having the face wan (*Shakspeare*).

PA'LELY. *ad.* (from *pale*.) Wanly; not freshly; not ruddily.

PALENCIA, a town of Spain, in Leon, and a bishop's see, with five churches, eleven convents, and two hospitals. It is seated on the Carrion, 23 miles N.N.E. of Valladolid, and 70 S.E. of Leon. Lon. 4. 28 W. Lat. 41. 59 N.

PA'LENESS. *s.* (from *pale*.) 1. Wanness; want of colour; want of freshness; sickly whiteness of look (*Pope*). 2. Want of colour; want of lustre (*Shakspeare*).

PA'LENDAR. *s.* A kind of coasting vessel.

PA'LEOUS. *a.* (*palea*, Lat.) Husky; chaffy.

PALERMO, a fortified city of Sicily, in Val di Mazara, capital of the island, and an archbishop's see. It stands on a bay of the same name, on the N. coast, near the extremity of a kind of natural amphitheatre, formed by high and rocky mountains. The country between the city and the mountains is one of the richest plains in the world; the whole appearing a magnificent garden, filled with fruitful trees, and watered by fountains and rivulets. The inhabitants of Palermo are estimated at 130,000. Two great streets intersect each other in the centre of the city, where they form a handsome square, called the Ottangolo, from the centre of which is seen the whole of these noble streets, and the four elegant gates which terminate them, each at the distance of half a mile. The Porto Felice opens to the Marino, a delightful walk, which has on one side the wall of the city, and on the other the sea; and in the centre is an elegant kind of temple, frequently made use of as an orchestra. The churches of Palermo are upward of 300, and many of them very rich and magnificent. The cathedral is a large Gothic structure, supported within by 80 columns of oriental granite, and divided into a great number of chapels, some of which are extremely rich, particularly that of St. Rosalia, the patroness of Palermo. The relics of this saint are preserved in a large box of silver, enriched with precious stones; and they are considered as the greatest treasures of the city. Here are also found the tombs of several of the ancient Norman kings, and of the emperors Henry VI. and Frederic II. of the finest prophery. The city is crowded with statues of sovereigns and tutelar saints placed in small courts and squares, upon pedestals of colossal proportion and tasteless form. In the streets women hide their heads in black veils; a very ancient mode of dress in this island. This city has suffered greatly at different periods, by earthquakes and inundations. The

harbour, defended by two castles, is dangerously open to the sea from the N.E.; and, even at the anchoring place, ships are in danger when a westerly wind rushes through the valley of Colli between the mountains. About the middle of the 11th century, the Norman king Roger established silk manufactures in this city, by means of prisoners taken in his war with the Greeks, and they still flourish, though not so lucrative since the manufacture has extended to Italy. One mile from Palermo is a celebrated convent of capuchins, in which is a vault made use of as a receptacle for the dead. It consists of four wide passages, each about forty feet in length, with arches along the sides, in which the bodies are set upright, clothed in coarse garments, with their heads, arms, and feet bare. They are prepared for this situation by keeping them six or seven months upon a gridiron, over a slow fire, till all the fat and moisture are consumed. In some of the higher niches they are laid out at full length, and at the top are children of six or seven years of age. On the floor are handsome trunks, containing the bodies of persons of distinction, the keys of which are kept by the relations. Palermo, in 1799, became the residence of the court, when the French made themselves masters of Naples. It is 110 miles W. of Messina, and 180 S. by W. of Naples. Lon. 13. 23 E. Lat. 38. 15 N.

PALES, the goddess of sheepfolds and of pastures among the Romans, was worshipped with great solemnity at Rome, and her festivals called Palilia, were celebrated the very day that Romulus began to lay the foundation of the city of Rome.

PALESTINE, in its present state, is a part of Asiatic Turkey situated between 31° 30' and 33° 20' north latitude, and between 34° 50' and 37° 15' east longitude. It is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which separates it from Arabia Deserta, on the east; by the mountains of Seir and the deserts of Arabia Petræa, on the south; and by the Mediterranean sea on the west.

This once fertile and happy spot was first called the land of Canaan, or Chanaan, from Noah's grandson. In Scripture, however, it is frequently distinguished by other names; such as the Land of Promise, the Land of God, the Land of Israel, &c. It received the name of Palestine from the Palestines, or Philistines, who possessed a great part of it; and it had the name of Judæa, or Judæa Palestina, from Judah, the most considerable of the twelve sons of Jacob. The Christians have denominated it the Holy Land; partly on account of the many singular blessings it received from the Divine Providence, and partly on account of its metropolis being made the centre of God's worship and his peculiar habitation; but much more for its being the place of our Saviour's birth, the scene of his preaching and manifold miracles; especially the place in which he accomplished the great work of our redemption. As to the name of Judæa; it did not

begin to receive that till after the return of the Jews from the Babylonish captivity, though it had been styled long before the Kingdom of Judah, in opposition to that of Israel, which revolted from it under Jeroboam, in the reign of Rehoboam the son of Solomon. But after the return, the tribe of Judah, the only one that made any figure, settling at Jerusalem, and in the countries adjacent, quickly gave its name to the whole territory. By profane authors it was called by many different names; such as Syria, Palestina Syria, Coelesyria, Iduma, Idumæa, and Phœnicia or Phœnice; but these are supposed only to have been given out of contempt to the Jewish nation, whom they looked upon as unworthy of any other name than what distinguished the most obscure parts of the neighbouring provinces.

That part of the country which was properly called the Land of Promise, was inclosed on the west by the Mediterranean; on the east by the lake Asphaltites, the Jordan, and the sea of Tiberias or of Galilee, and the Samachonite lake; to the north it had the mountains of Libanus, or rather of Antilibanus, or the province of Phœnicia; and to the south, that of Edom or Idumæa, from which it was likewise parted by another ridge of high mountains. The boundaries of the other part, which belonged to the two tribes and an half beyond the river Jordan, are not so easily defined, as well as those of the conquests made by the more prosperous kings of the Jews. All that can be said with any probability is, that the river Arnon was the first northern boundary on that side; and with respect to those on this side the Jordan, there is a considerable disagreement between the Hebrew and Samaritan versions of the Pentateuch.

The extent of this country is likewise variously settled by geographers; some giving it no more than 170 or 180 miles from north to south, and 140 in breadth where broadest, though not much above half that breadth where narrowest. But from the latest and most accurate maps, it appears to extend near 200 miles in length, and about 80 in breadth about the middle, and about 10 or 15, more or less, where it widens or shrinks.

For a minute account of Palestine we cannot do better than refer to Wells's Scripture Geography.

PALESTRINA, one of the largest of the islands called the Lagunes, near Venice. It has a town of the same name, six miles S. of Venice.

PALESTRINA, anciently Præneste, an episcopal town of Italy, in Campagna di Roma, with the title of a principality. Here formerly stood a temple dedicated to Fortune, the ruins of which may yet be seen. It is 25 miles E. by S. of Rome. Lon. 13. 5 E. Lat. 41. 52 N.

PALETTE. *s.* (*palette*, French.) A light board on which a painter holds his colours when he paints (*Tickel*).

PALEY (William), an eminent divine, born at Peterborough, 1743. He was educated under his father who was a clergyman, at Gigg-

swick school, Yorkshire, and then at Christ's college, Cambridge. He was for three years after assistant at Greenwich school, and then became an active tutor in his college, and had for his coadjutor Dr. Law, afterwards bishop of Elphin. By the kindness of his friend's father, who was bishop of Carlisle, he obtained a living in Cumberland, and next Appleby, in Westmorland, and a prebend in Carlisle cathedral, and the living of Dalston. In 1780 he was made chancellor of Carlisle, and in 1785 he published his *Elements of Moral and Political Philosophy*, in 4to. a most valuable work, often reprinted, in 2 vols. 8vo. In 1780, he declined the mastership of Jesus college, Cambridge, which the bishop of Ely wished to confer upon him. He was afterwards presented to a prebend at St. Paul's, and to the living of Bishop Wearmouth. He published, in 1790, *Horæ Paulinæ*, or the truth of the scripture history of St. Paul, &c. 8vo.—a *View of the Evidences of Christianity*, 3 vols. 8vo. 1794, dedicated to the bishop of Ely.—*Natural Theology*, 8vo, 1802; besides some single sermons. He died at Sunderland, in 1805, aged 62 years. Since his death a volume of posthumous sermons has been published, several of which are very excellent.

The works of this very able author are most highly and deservedly esteemed. His *Moral Philosophy* is in many respects an admirable work, though the theory of expediency which he adopts is open to many abuses, which have been ably exposed by Mr. Gisborne. The political speculations, if not the most valuable part of his work, are certainly that part in which his talents are most eminently displayed. His observations on the laws and constitution of this kingdom shew that he had imbibed very largely the spirit of our jurisprudence, and are founded upon enlarged views, such as are rarely taken by those who, in the course of their professional studies, make greater legal acquisitions. The chapters in which he discusses the duties and interests of those who govern kingdoms are no less worthy of attention; and in the latter part of the volume he investigates the causes of national prosperity, and the means by which they may be rendered most efficacious, with a degree of skill and originality which may justly intitle him to be ranked among the greatest masters of the science of political economy. The political writings of Dr. Paley have been studied and admired by the most illustrious statesmen of the present times. It would be useless to enumerate the praises with which they have been honoured; but the last and perhaps the most enviable that were bestowed on them were connected with circumstances so peculiar as to be deserving of mention. In the debate on the catholic question twelve days before his death, Mr. Fox in the House of Commons read two passages from his work which contained the leading ideas of the celebrated speech delivered on that occasion. Both of these Mr. Fox prefaced with very high compliments, and when speaking of the first said, that the author, though living,

ought not to be defrauded of his due praise, and that he therefore would not conceal his name. This expression was imperfectly understood by most of the reporters, who in their accounts of the debate represented Mr. Fox as describing him to be not living, and spread about the kingdom false intelligence that he was dead just when he was labouring under the illness which was the cause of his death.

Dr. Paley's View of the Evidences of Christianity is justly esteemed the most decisive work which has ever been published on the subject. His *Horæ Paulinæ* is not the most popular of his works, though it perhaps is that which is most admired by his judicious readers for the originality of the design and the vigour of the execution. It is an exposition and consideration of the evidences of the truth of the christian religion, which may be derived from the conversion and ministry of St. Paul, and especially from the numerous obviously undesigned coincidences between Paul's Epistles and the history of the Acts of the Apostles, written by Luke. Dr. Paley professes to have chosen the subject of his work on Natural Theology, because, with those he had already treated of, it formed a system which was complete, though its parts had been produced in an inverted order. In his Natural Theology, *Horæ Paulinæ*, and Evidences of Christianity, he proved the truth of religion, natural and revealed; and in his Moral and Political Philosophy taught the duties which result from and are sanctioned by the proof. He had undoubtedly another reason for the choice of this subject, that it was eminently adapted to his talents. To reason perspicuously and illustrate happily, were the powers by which he was most distinguished, and what other subject offered such admirable materials to exercise them? He has traced and shewn the marks of wisdom and design in various parts of the creation, but has dwelt principally on those which may be discovered in the constitution of the human body. The book contains almost a complete treatise of anatomy, which, by the observations he has interspersed, and by the excellence of his descriptions, he has contrived to render interesting even to those who read without any previous knowledge of the science. To be secure of immortality an author must be recommended either by striking excellencies of language or of sentiment, or by an happy arrangement of the parts of his subject, which renders them necessary to each other and incapable of separation. Valuable matter cannot alone preserve the name of the author, for of that he may be plundered by the writers of a succeeding age, who being able to consult its taste, will necessarily be more popular than an ancient whose productions have not some intrinsic superiority. Dr. Paley is not remarkable for elegant periods or splendid sentiments. He seems to have been less ambitious of pleasing the ear than of informing the understanding; for if we except the dedication of the Moral and Political Philosophy, some chapters in the same work (particularly that On reve-

rencing the Deity), and the conclusion of the Natural Theology, which contain some of the most elegant and dignified passages to be found in the language; the general characteristic of his writings is plainness and simplicity. But this is the genuine didactic style, and he has imparted to it all those numerous graces of which it is capable. It will be universally allowed that no author ever wrote so pleasingly on the subjects he has treated of. The force and terseness of his expressions is not less admirable than the strength of his conceptions, and there is both in his language and his ideas a peculiarity of manner stamped by the vigour and independence of his mind, which cannot be borrowed, and which will therefore perpetuate his reputation. He has merit to deserve readers, and allurements to attract them, and will preserve a high rank among those writers of his country, who can command the attention of posterity. He is one of the best writers of what may be called the English matter of fact style, that ever lived.

During the greater part of Dr. Paley's life he was a most decided Socinian; during the last three or four years, however, he seems to have examined doctrinal points with great attention: and the consequence was, as might naturally be expected, a total change in many of his sentiments. Several of his posthumous sermons are quite evangelical in sentiment; and if they are not all so, it has happened, we conjecture, from the gradual change in his views during the latter part of his life, and his inability during his last illness to give those sermons such a revival as he would have done, had he intended their publication.

PALFREY, is one of the better sort of horses used by noblemen or others for state; and sometimes of old taken for a horse fit for a woman to ride. Camden says, that William Fauconberge held the manor of Cukeny, in the county of Nottingham, in serjeantry, by the service of shoeing the king's palfrey when the king should come to Mansfield.

PALFREYED, *a.* (from *palfrey*.) Riding on a palfrey (*Ticket*).

PALICAUT, a fort of Hindustan, in Malabar, built by Hyder, on his conquest of that province. Around it are scattered many villages, which contain a considerable population and have some trade. It stands between two rivulets, near their junction, at the foot of the southern extremity of the Gauts, 25 miles W.S.W. of Coimbatore, and 56 E. by N. of Paniany.

PALIFICATION, *s.* (*palus*, Lat.) The act or practice of making ground firm with piles (*Wotton*).

PALICI, or PALISCI, two deities, sons of Jupiter by Thalia, whom Æchylus calls Ætna, in a tragedy now lost. According to Macrobius, Ætna, when pregnant, entreated Jupiter to remove her from the pursuits of Juno. The god concealed her in the bowels of the earth, and when the time of her delivery was come, the earth opened and brought into the world two children, who received the name of Palici;

quasi, ἀπὸ τοῦ παλιν μισθαι, because they came again into the world from the bowels of the earth. These deities were worshipped with great ceremonies by the Sicilians.

PALILIA, a festival celebrated by the Romans, in honour of the goddess Pales. The ceremony consisted in burning heaps of straw, and in leaping over them. The purification of the flocks was made with the smoke of sulphur, of the olive, the pine, the laurel, and the rosemary. Offerings of mild cheese, boiled wine, and cakes of millet were afterwards made to the goddess. This festival was observed on the 21st of April. Some call this festival *Parilia quasi a pariendo*, because the sacrifices were offered to the divinity for the fecundity of the flocks.

PALIMBAN, the capital of a kingdom of the same name, on the S.E. coast of the island of Sumatra. The Dutch have a fort here, and purchase large quantities of pepper. It stands on the river Palimban, about 50 miles from the sea, and 130 N.E. of Bencoolen. Lon. 103. 45 E. Lat. 2. 56 S.

PALINDROMUS, a verse or sentence which runs the same when read either backwards or forwards. Such is the verse, *Roma tibi subito motibus ibit amor*. Some people of leisure have refined upon the palindromus, and composed verses, each word of which is the same backwards as forwards; for instance, that of Camden:

*Odo tenet mulum, madidam mappam tenet Anna.
Anna tenet mappam, madidam mulum tenet Odo.*

PALINGENESIA, among divines, the same with regeneration. Among chemists, it denotes the producing of a body from its principles.

PALINGENIUS (Marcellus), an Italian poet of the 16th century, born in Ferrara. He wrote and dedicated to his patron Hercules II. duke of Ferrara, his poem in 12 books, called *Zodiacus Vitæ*; but he spoke with such freedom of the popish clergy, that not only the book was prohibited, but the body of the author was ordered to be dug up and burnt, which was, however, prevented by the duchess of Ferrara.

PALINODE, **PA'LINODY**. *s.* (*παλινωδια*.) A recantation (*Sandys*).

PALINURUS, in fabulous history, a skillful pilot of the ship of Æneas. He fell into the sea in his sleep, and was three days exposed to the tempests and agitation of the sea, and at last came safe to the sea shore, where the cruel inhabitants of the place murdered him. Æneas, when he visited the infernal regions, saw Palinurus, and assured him, that though his bones were deprived of a funeral, yet the place where his body was exposed should soon be adorned with a monument, and bear his name, and accordingly a promontory was called Palinurus.

PALISADES, in fortification, stakes made of strong split wood, about nine feet long, six or seven inches square, three feet deep in the ground, in rows about two and a half or three

inches asunder, placed in the covert way, at three feet from, and parallel to the parapet or side of the glacies, to secure it from surprise. They are also used to fortify the avenues of open forts, gorges, half moons, the bottoms of ditches, and in general all posts liable to surprise. They are usually fixed perpendicularly, though some make an angle inclining towards the ground next the enemy, that the ropes cast over them to tear them up may slip off.

To PALISA'DE. v. a. (from the noun.) To enclose with palisades.

PALISH. *a.* Somewhat pale.

PALK STRAIT, a strait at the north end of the island of Ceylon, in the bay of Bengal, which separates that island from the coast of Tanjore in Hindustan. It is celebrated for the extensive pearl fishery which is carried on in it, on both shores, lately by the Dutch, and now by the English.

PALL. *s.* (*pallium*, Latin.) 1. A cloak or mantle of state (*Milton*). 2. The mantle of an archbishop (*Ayliffe*). 3. The covering thrown over the dead (*Dryden*).

To PALL. v. a. (from the noun.) To cloak; to invest (*Shakspeare*).

To PALL. v. n. (perhaps a corruption of *pale*.) To grow vapid; to become insipid (*Addison*).

To PALL. v. a. 1. To make insipid or vapid (*Atterbury*). 2. To make spiritless; to dispirit (*Dryden*). 3. To weaken; to impair (*Shakspeare*). 4. To cloy (*Tatler*).

PALL, in heraldry, a figure like a Greek π , about the breadth of a pallet; it is by some heralds called a cross-pall, on account of its being looked upon as an archiepiscopal bearing.

PALLA, in Roman antiquity, a mantle which women wore over the gown called *stola*. It was borne on the left shoulder; whence passing to the other side, under the right arm, the two ends were bound under the left arm, leaving the breast and arm quite bare. It had a great many folds, and derived its name from *παλλω*, to shake or tremble.

PALLADIO (Andrew), an Italian architect, born at Vicenza, in Lombardy. He was early instructed in architecture, and by visiting Rome he viewed and studied the venerable relics of ancient times. He made very beautiful drawings of these precious monuments, and published them with commentaries, and afterwards gave to the world his four books of architecture, in 1570, a work translated into French, and also into English, and commented upon by Inigo Jones. His most magnificent edifice is the theatre called *Degli Olimpici* at Vicenza. He died 1580.

PALLADIUM, a celebrated statue of Pallas, representing the goddess as sitting and holding a pike in her right hand, and in her left a distaff and a spindle. It is said it fell down from heaven near the tent of Ilus, as that prince was building the citadel of Ilium. Others give it a different origin, but however discordant their opinions be about this famous

statue, it is universally agreed, that on its preservation depended the safety of Troy. This fatality was well known to the Greeks during the Trojan war, and therefore Ulysses and Diomedes were commissioned to steal it away, which they effected, by, it is asserted, the assistance of Helenus the son of Priam, who proved in this unfaithful to his country. Minerva was displeased with the violence offered to her statue, and according to Virgil the Palladium itself appeared to have received life, and by the flashes from its eyes, and sudden springs from the earth, indicated the resentment of the goddess. Some affirm, that the true Palladium was not taken by Ulysses and Diomedes, but that Æneas carried it with him into Italy.

PALLADIUM, a metal obtained from the ore of platina. See **PLATINUM**.

PALLANTIDES, the fifty sons of Pallas, the brother of Ægeus. They were all killed by Theseus, the son of Ægeus, whom they opposed when he came to take possession of his father's kingdom.

PALLAS, a freed man of Claudius, famous for his power and riches. He advised the emperor to marry Agrippina, and to adopt her son Nero. It was by his means, and those of Agrippina, that the death of Claudius was hastened, and that Nero was raised to the throne. Nero afterwards discarded Pallas, and some time after caused him to be put to death, that he might make himself master of his great riches, A. D. 61.

PALLAS (*adis*), the same as Minerva. She received this name either because she killed the giant Pallas, or from the spear which she seems to brandish in her hands, (*παλλειν*). See **MINERVA**.

PALLAS (*antis*), a son of king Evander, sent with some troops to assist Æneas. He was killed by Turnus, the king of the Rutuli, after he had made a great slaughter of the enemy. (*Virgil*). One of the giants, son of Tartarus and Terra. He was killed by Minerva.

PALLASIA, in botany, a genus of the class syngenesia, order polygamia frustranea. Receptacle chaffy, downless; seeds vertical; flat, with a ciliate margin, calyx imbricate. Two species; Mexican plants.

PALLAVICINI (Anthony), a native of Genoa. His abilities recommended him to the pope, who employed him in several embassies, and made him bishop of Pampeluna, and a cardinal. He died 1507, aged 66.

PALLAVICINI (Ferrant), an eccentric Italian, born at Placentia. He assumed the habit of an Augustine friar; but instead of a regular life, he devoted himself to the amours of courtezans. Poor by his incontinence, he had recourse to his pen for support, and wrote his Courier robbed of his Mail, a periodical work, which for a while was read with avidity; but soon, from its satirical nature, was noticed by the inquisition. He avoided persecution by travelling into Germany; but upon his return to Venice he resumed his Courier, and in greater violence vented his satire even against

the pope. He was seized, but made his escape by means of one of his mistresses; and he might have avoided the impending storm, had not Morfu, a creature of the pope's nuncio, prevailed on him to go to France, in hopes of meeting encouragement from Richlieu. Pallavicini was caught in the snare; but instead of being conducted to Paris, he was brought to Avignon, where after some severe and inhuman treatment he was brought to trial and condemned to lose his head, which took place at Avignon, 1644. Morfu, who had been rewarded for his villainy, was afterwards murdered by one of Pallavicini's friends. He wrote some books of merit, printed at Venice, 4 vols. 12mo. 1655.

PALLAVICINI (Sforze), a cardinal, born at Rome, 1607. He entered among the jesuits, and taught philosophy and theology, and gained the respect of the world. He was made a cardinal, and died 1667, aged 60. He wrote an Italian treatise on style, and on dialogue—some letters—but his best known work is the History of the Council of Trent, in opposition to that of father Paul.

PALLENE, a small peninsula of Macedonia, formerly called Phlegra, situate above the bay of Thermæ on the Ægean sea, and containing five cities, the principal of which is called Pallene. It was in this place, according to some of the ancients, that an engagement happened between the gods and the giants.—2. A village of Attica, where Minerva had a temple, and where the Pallantides chiefly resided.

PA'LLET. *s.* (from *paille*, Fr. straw.) 1. A small bed; a mean bed (*Wotton*). 2. (*palette*, Fr.) A small measure of liquid, formerly used by chirurgeons (*Hakewill*).

PALLET, among painters. See **PALETTE**.

PALLET, in gilding, an instrument made of a squirrel's tail, to take up the gold leaves from the pillow, and to apply and extend them on the matter to be gilt. See **GILDING**.

PALLET, in heraldry, is nothing but a small pale consisting of one half of it in breadth, and therefore there are sometimes several of them upon one shield.

PALLET is also a part belonging to the balance of a watch or movement. See the article **WATCH**.

PALLIAMENT. *s.* (*pallium*, Lat.) A dress; a robe (*Shakspeare*).

PALLIARDISE. *s.* (*palliardise*, Fr.) Fornication; whoring; obsolete.

To PALLIATE. *v. a.* (*pallio*, Lat. *pallier*, Fr.) 1. To cover with excuse (*Swift*). 2. To extenuate; to soften by favourable representations (*Dryden*). 3. To cure imperfectly or temporarily, not radically; to ease, not cure.

PALLIATION. *s.* (*palliation*, French.) 1. Extenuation; alleviation; favourable representation (*King Charles*). 2. Imperfect or temporary, not radical cure; mitigation, not cure (*Bacon*).

PALLIATIVE. *a.* (*palliatif*, Fr.) 1. Extenuating; favourably representative. 2. Mitigating, not removing; temporarily, not radically curative (*Arbuthnot*).

PA'LLIATIVE. *s.* (from *palliate*.) Something mitigating (*Swift*).

PA'LLID. *a.* (*pallidus*, Latin.) Pale; not highly coloured; not bright (*Spenser*).

PALLIO COOPERIRE. It was an ancient custom, where children were born out of lawful wedlock, and their parents were afterwards married, that those children, together with the father and mother, should stand *pallio cooperti*, under a cloth, while the marriage was solemnizing; which was a kind of adoption, and had the effect of a legitimation. Thus Robert Grosthead, the famous bishop of Lincoln, in one of his letters, says: *In signum legitimations, nati ante matrimonium consueverunt puni sub pallio super parentes eorum extento, in matrimonii solemnizatione*. Selden, in his notes on Fleta, adds, that the children of John of Gaunt, duke of Lancaster, by Catharine Swinford, though legitimated by act of parliament, yet were covered with the pall when their parents were married.

PALLISER ISLANDS, a group of islands in the Pacific ocean; the largest about 15 miles long and 10 broad: Lon. 146. 30 W. Lat. 15. 38 S.

PALLIUM, in antiquity, an upper garment or mantle worn by the Greeks, as the toga was by the Romans. Each of these were so peculiar to the respective nations, that Palliatus is used to signify a Greek, and Togatus a Roman.

PALLMA'LL. *s.* (*pila*, and *malleus*, Latin; *pale maille*, French.) A play in which the ball is struck with a mallet through an iron ring.

PALM. *s.* (*palma*, Latin.) 1. A tree of great variety of species; of which the branches were worn in token of victory: it therefore implies superiority (*Miller*). 2. Victory; triumph (*Dryden*). 3. The inner part of the hand (*Bacon*). 4. A hand, or measure of length, comprising three inches (*Denham*).

To PALM. *v. a.* (from the noun.) 1. To conceal in the palm of the hand, as jugglers (*Prior*). 2. To impose by fraud (*Dryden*). 3. To handle (*Prior*). 4. To stroak with the hand (*Ainsworth*).

PALM TREE. See CHEMÆROPS.

PALM TREE (Dwarf). See CHEMÆROPS.

PALM (Cocoa-nut). See COCOS.

PALM (Frausal nut). See ARECA.

PALM (Mountain fan). See CORYPHA.

PALM SUNDAY, the Sunday next before Easter, being so called in memory of our Saviour's triumphant entry into Jerusalem, when the attending multitude strewed branches in his way.

PALM OIL. (*oleum palmæ*.) This oil is produced chiefly from the fruit of the *cocos butyracea inermis*, frondibus pennatis: foliolis simplicibus of Linnæus, by bruising and dissolving the kernels of the fruit in water, without the aid of heat, by which the oil is separated, and rises to the surface, and on being washed two or three times is rendered fit for use. When brought into this country it is of the consistence of an ointment, and of an orange yellow colour, with little taste, and of a

strong, though not disagreeable, smell. Its use is confined to external applications in pains, tumours, and sprains; but it appears to possess very little, if any, advantage over other bland oils. See OIL.

PALMA, one of the Canary islands, to the N. of Ferro, 50 miles in circumference, and very fertile. It has a town of the same name, much frequented for its excellent wines, and safe harbour. Lon. 17. 50 W. Lat. 28. 37 N.

PALMA, a town of Spain, in Andalusia, on the Xenil, near its conflux with the Guadalquivir, 30 miles S.W. of Cordova.

PALMA, or PALMA NUOVA, a strong frontier town of Italy, in Friuli, seated on a canal, which communicates with the Lizonzo, 10 miles S.E. of Udina, and 55 N.E. of Venice. Lon. 13. 15 E. Lat. 46. 2 N.

PALMA CHRISTI, in botany. See RICINUS.

PALMÆ, in botany, the sixth family; and the first of the nine great tribes, nations, or casts, into which Linnæus has divided all vegetables. They are placed in the appendix to the Artificial System, and take the lead in the natural orders, though Linnæus had placed them only in the second place, in his Fragments of a Natural Method.

PALMARIS BREVIS. (*palmaris*, from *palma*, the hand.) In myology, a small, thin, cutaneous flexor muscle of the hand, situated on the fore arm, between the wrist and the little finger. Fallopius tells us, that it was discovered by Cananus. Winslow names it *palmaris cutaneus*. It arises from a small part of the internal annular ligament, and inner edge of the aponeurosis *palmaris*, and is inserted by small bundles of fleshy fibres into the *os pisiforme*, and into the skin and fat that cover the abductor minimi digiti. This muscle seems to assist in contracting the palm of the hand.

PALMARIS CUTANEUS. See PALMARIS BREVIS.

PALMARIS LONGUS. *Ulnaris gracilis* of Winslow. A flexor muscle of the arm situated on the fore arm, immediately under the integuments. It arises tendinous from the inner condyle of the *os humeri*, but soon becomes fleshy, and after continuing so about three inches, terminates in a long slender tendon, which near the wrist separates into two portions, one of which is inserted into the internal annular ligament, and the other loses itself in a tendinous membrane, that is nearly of a triangular shape, and extends over the palm of the hand, from the carpal ligament to the roots of the fingers, and is called *aponeurosis palmaris*. Some of the fibres of this expansion adhere strongly to the metacarpal bones, and separate the muscles and tendons of each finger. Several anatomical writers have considered this aponeurosis as a production of the tendon of this muscle, but seemingly without reason, because we now and then find the latter wholly inserted into the carpal ligament, in which case it is perfectly distinct from the

aponeurosis in question; and, in some subjects, the palmaris longus is wanting, but the aponeurosis is always to be found. Rhodius indeed says that the latter is now and then deficient, but there is good reason to think that he was mistaken. This muscle bends the hand, and may assist in its pronation; it likewise serves to stretch the aponeurosis palmaris.

PALMAS, a river of Mexico, formed by the junction of the Nassas and Saucedas, in New Biscay, and thence flows E. about 200 miles, between the provinces of Panuco and New Leon, into the gulf of Mexico.

PALMAS, the capital of the island of Canaria. See CANARY.

PALMAS, one of the Philippine islands, 16 leagues S.E. of Mindanao. Lon. 127. 0 E. Lat. 5. 33 N.

PALMAS CAPE, a promontory on the Ivory coast of Guinea. Lon. 5. 34 W. Lat. 4. 26 N.

PALMATE, in ornithology, webbed, as the feet of some water-birds.

PALMATE ROOT, in botany, consisting of several oblong tubers or knobs, spreading out like the fingers. As in some sorts of orchis.

PALMATE LEAF. A hand-shaped leaf. Longitudinaliter in partes plures subæquales divisum versus basin, qua tamen coherens in unum. Philos. Bot.—Divisum ultra dimidium in lobo subæquales. Delin. Pl.—Divided beyond the middle into several lobes that are nearly equal: as in *passiflora cærulea*. It resembles the hand with the fingers spread; and is one of the simple leaves: whereas the digitate leaf resembles the fingers spread, without the hand; and, having all the leaflets separate, is one of the compound leaves.

PALMER. *s.* (from *palm*.) A pilgrim: they who returned from the Holy Land carried branches of palm.

PALMER, in angling. See FISHING FLIES.

PALMERWORM. *s.* (*palmer* and *worm*.) A worm covered with hair, a caterpillar.

PALMERSTON ISLE, an island in the Pacific ocean, discovered by Cook, in 1774. It consists of about ten islets, connected by a reef of coral rocks, and lying in a circular direction; the principal one not exceeding a mile in circumference, nor more than three feet above the level of the sea. It abounds with cocoa-nuts, scurvygrass, and the wharra-tree, but has no inhabitants. Lon. 162. 57 W. Lat. 18. 0 S.

PALMETTO, in botany. See CHEMÉOPROS.

PALMI FEROUS. *a.* (*palma* and *fero*, Lat.) Bearing palms.

PALMIPEDE. *a.* (*palma* and *pes*, Lat.) Webfooted (*Brown*).

PALMISTER. *s.* (from *palma*, Lat.) One who deals in palmistry.

PALMISTRY. *s.* (*palma*, Latin.) 1. The cheat of foretelling fortune by the lines of the palm (*Cleaveland*). 2. The action of the hand (*Addison*).

PALMY. *a.* (from *palm*.) Bearing palms.

PALMYRA, or TADMOR, once a magni-

ficent city of Syria, originally built by king Solomon, in the midst of a sandy desert, bounded on three sides by a chain of high mountains. On the decline of the Macedonian empire in the east it became the capital of a principality, under the name of Palmyra; and it declared for the Romans on Adrian marching his army through Syria to Egypt. The city flourished and increased to the time of Aurelian, when it resisted the Roman power under queen Zenobia, who held it out a long time, but was at length taken captive, and led in triumph through the streets of Rome. Soon afterward the inhabitants massacred the soldiers who had been left in garrison; which outrage occasioned the return of Aurelius, who, having made himself master of the place, caused all the inhabitants to be destroyed, and gave the pillage of the city to the soldiers. The stupendous ruins of this city were visited in 1751 by Mr. Wood, who published a splendid account of them in 1753. The inhabitants then consisted of about forty families, living in mud cottages, erected within the spacious court of a once magnificent temple. Palmyra is 100 miles S.E. of Aleppo. Lon. 38. 50 E. Lat. 33. 20 N.

PALMYRA ISLAND, an island in the South Sea, discovered by Capt. Sowle in the American ship Palmyra, November 10, 1802. This island is situated in latitude 5° 49' N. and in longitude 162° 23' W. from London; it is about three leagues in extent; there are two lagoons on it; in the westernmost of which is twenty fathom water, with a fine sandy bottom. It is very dangerous to approach the western part of the island, on account of the coral rocks which are just below the surface of the water, and extend to the distance of three or four leagues from the shore. The eastern part terminates in a steep reef of coral, over which the sea breaks with considerable force. On the north-west side there is good anchoring ground, about three quarters of a mile from the breakers, in eighteen fathom water on a coral bottom. There are no inhabitants on the island; nor was any fresh water found: but cocoa nuts, of very large size, are in great abundance; and fish of various kinds, and in large shoals, surrounded the land. A great quantity of drift-wood lay on the beach, which enabled those who landed to ascertain that the rise of the tide was about eighteen inches. (*Monthly Magazine*, Nov. 1804.)

PALNAUD, a district of Hindustan, belonging to the Carnatic, situate between the river Kistna, and to the W. of the Guntoor circar. Timerycotta is the principal place.

PALOS, a seaport of Spain, in Andalusia, with a tolerable harbour; celebrated for being the place whence Columbus sailed on his first adventurous voyage in 1492. It is seated at the mouth of the Tinto, 50 miles W. by S. of Seville. Lon. 6. 52 W. Lat. 37. 10 N.

PALPABILITY. *s.* (from *palpable*.) Quality of being perceivable to the touch (*Pope*).

PALPABLE. *a.* (*palpable*, French.) 1,

PAL

Perceptible by the touch (*Milton*). 2. Gross; coarse; easily detected (*Tillotson*). 3. Plain; easily perceptible (*Hooker*).

PALPABLENESS. *s.* (from *palpable*.) Quality of being palpable; plainness; grossness.

PALPABLY. *ad.* (from *palpable*.) 1. In such a manner as to be perceived by the touch. 2. Grossly; plainly (*Bacon*).

PALPATION. *s.* (*palpatio, palpor*, Lat.) The act of feeling.

To PALPITATE. *v. a.* (*palpito*, Latin.) To beat as the heart; to flutter.

PALPEBRÆ. (*palpebra*.) In anatomy. The eyelids, distinguished into upper and under: at each end they unite and form the canthus.

PALPEBRÆ SUPERIORIS LEVATOR. In myology. See **LEVATOR PALPEBRÆ SUPERIORIS**.

PALPEBRUM APERIENS RECTUS. See **LEVATOR PALPEBRÆ SUPERIORIS**.

PALPITATION. (*palpitatio*.) In medicine. Palpitation of the heart, which is either constant or frequently returning. A genus of disease in the class neuroses, and order spasmi of Cullen.

PALSGRAVE. *s.* (*paltsgraff*, German.) A count or earl who has the overseeing of a palace.

PALSICAL. *a.* (from *palsy*.) Afflicted with a palsy; paralytic.

PALSIED. *a.* (from *palsy*.) Diseased with a palsy (*Decay of Piety*).

PALSY. See **HEMIPLEGIA, PARAPLEGIA, PARALYSIS, &c.**

PALTE, a famous lake of Thibet, lying to the S. of Lassa, about three days journey, and 12 miles S. of the river Sanpoo or Burrampooter. It is 150 miles in circumference; and in the middle of it is one large island. On the W. shore of this island, or congeries of islands, is a monastery, and the seat of the Lamissa Turcepamo, or the Great Regenerate, in whom the Thibetians think that a divine spirit is regenerated, as it is in the Great Lama. The word Lama signifies a priest, and Lamissa is the feminine of Lama.

To PALTER. *v. n.* (from *paltron*, *Skinner*.) To shift; to dodge: not in use (*Shakspeare*).

To PALTER. *v. a.* To squander: as, he palters his fortune (*Ainsworth*).

PALTERER. *s.* (from *palter*.) An insincere dealer; a shifter.

PALTRINESS. *s.* (from *paltry*.) The state of being paltry.

PALTRY. *a.* (*poltron*, French, a scoundrel.) Sorry; worthless; despicable; contemptible; mean (*Addison*).

PALUS MEOTIS, the ancient name of a gulph between Europe and Asia, to the north of the Black Sea, now called the sea of Zabach, or Asoph.

PALY, or **PALE**, in heraldry, is when the shield is divided into four or more equal parts, by perpendicular lines falling from the top to the bottom.

PALY BEND, is when the escutcheon is

PAN

divided by perpendicular lines, which is paly; and also by diagonals, which is called bendy.

PAM, the knave of clubs.

PAMIERS, a town of France, in the department of Arriege, with a bishop's see. It is not so considerable as formerly, nor peopled in proportion to its extent. Near it is a mineral spring, said to cure the gout and obstructions. Pamiers is seated on the Arriege, eight miles N. of Foix, and 39 S. of Toulouse. Lon. 1. 32 E. Lat. 43. 8 N.

PAMLICO SOUND, a kind of inland sea of N. Carolina, 100 miles long and from 10 to 20 broad. It is separated, in its whole length, from the Atlantic, by a beach of sand, hardly a mile wide, generally covered by small trees or bushes. It has several inlets; but that of Ocrecock is the only one that will admit vessels of burden. This inlet is in lon. 76. 20 W. lat. 35. 10 N.

PAMPELONNE, a town of France, in the department of Tarn, 15 miles N. by E. of Alby. Lon. 2. 17 E. Lat. 44. 10 N.

PAMPELUNA, a town of Spain, capital of Upper Navarre, with a strong citadel, and a rich bishopric. Its squares are handsome, and adorned with shops full of rich merchandise. It is seated on the Arga, 42 miles S. of Bayonne, and 167 N.E. of Madrid. Lon. 1. 35 W. Lat. 42. 47 N.

PAMPELUNA, a town of New Granada, famous for its mines of gold, and numerous flocks of sheep. It is 150 miles N. by E. of St. Fé de Bagota. Lon. 71. 30 W. Lat. 6. 30 N.

To PAMPER. *v. a.* (*pamberare*, Italian.) To glut; to fill with food; to saginate (*Pope*).

PAMPHILUS, a celebrated painter of Macedonia, in the age of Philip. He was founder of the school for painting at Sicyon. Apelles was one of his pupils.

PAMPHYLIA, a province of Asia Minor, anciently called Mopsopia, and bounded on the south by a part of the Mediterranean, called the Pamphylian sea, west by Lycia, north by Pisidia, and east by Cilicia. It abounded with pastures, vines, and olives.

PAMPHLET. *s.* (*par un filet*, French.) A small book; properly a book sold unbound, and only stitched (*Clarendon*).

To PAMPHLET. *v. n.* (from the noun.) To write small books (*Howell*).

PAMPHLETEER. *s.* (from *pamphlet*.) A scribbler of small books (*Swift*).

To PAN. *v. a.* An old word denoting to close or join together (*Ainsworth*).

PAN. *s.* (*ponne*, Saxon.) 1. A vessel broad and shallow (*Spenser*). 2. The part of the lock of the gun that holds the powder (*Boyle*). 3. Any thing hollow: as, the brain *pan*.

PAN, in ancient mythology, was the god of shepherds, of huntsmen, and of all the inhabitants of the country. He was the son of Mercury, by Dryope, according to Homer. Different authors have given him different parents. Pan, however, was a monster in appearance; he had two small horns on his head, his complexion was ruddy, his nose flat, and his legs,

thighs, tail, and feet, were those of a goat. His education was entrusted to a nymph of Arcadia, called Sinoe, but the nurse, according to Homer, terrified at the monster, fled away and left him. He was wrapped up in the skins of beasts by his father, and carried to heaven, where Jupiter and the gods long entertained themselves with the oddity of his appearance. There Bacchus gave him the name of Pan. The god of shepherds chiefly resided in Arcadia, where the woods and the most rugged mountains were his habitation. He invented the flute with seven reeds, which he called *Syrinx*, in honour of a nymph of the same name who was changed into a reed. He was continually employed in deceiving the neighbouring nymphs, and captivated Diana, by transforming himself into a beautiful white goat. He was also enamoured of a nymph of the mountains called *Echo*, by whom he had a son called *Lynx*. He also paid his addresses to *Omphale*, queen of *Lydia*. The worship of Pan was well established, particularly in Arcadia, where he gave oracles on mount *Lycaeus*. His festivals, called by the Greeks *Lyceæ*, were brought to Italy by *Evander*, and they were well known at Rome by the name of the *Lupercalia*. (See *LUPERCALIA*.) The worship, and the different functions of Pan, are derived from the mythology of the ancient Egyptians. As Pan usually terrified the inhabitants of the neighbouring country, that kind of fear which often seizes men, and which is only imaginary, has received from him the name of *panic fear*.

PAN, or PAHANG, a town on the E. coast of the peninsula of Malacca. It is the capital of a kingdom of the same name, remarkable for the great number of elephants, and for the plenty of pepper it produces. Pan is 140 miles N.E. of Malacca. Lon. 103. 20 E. Lat. 3. 55 N.

PANACEA. (*panacea*, *πανακεια*; from *παν*, all, and *ακεωμαι*, to make well.) An epithet given by the ancients to those remedies which they conceived would cure every disease. Unfortunately for those of the present day, there are no such remedies.

Some derive the name from *Panacea*, a daughter of *Æsculapius* who presided over health.

PANADA. (*pane*, bread, Ital.). Bread boiled in water to a proper consistence for feeding children or infirm persons with.

PANÆTIUS, a stoic philosopher of Rhodes, 138 B. C. He studied at Athens for some time, thence he came to Rome, where he reckoned among his pupils *Lælius* and *Scipio*, the second Africanus. To the latter he was attached by the closest ties of friendship and familiarity: he attended him in his expeditions, and partook of all his pleasures and amusements. *Panætius* wrote a treatise on the duties of man, whose merit can be ascertained from the encomiums which *Cicero* bestows upon it.

PANAGIA, a town of Turkey in Europe,

in Romania, 14 miles N. of Gallipoli. Lon. 27. 2 E. Lat. 40. 40 N.

PANAMA, the capital of *Terra Firma* Proper, and the seat of a royal audience and of a bishop. It was built in 1517, and was sacked and burnt by the English buccaneers in 1670. Before the abolition of the trade by the galeons, in 1748, the Spaniards of *Chili* and *Peru*, in order to be supplied with the products and manufactures of Europe, were obliged to repair to *Porto Bello* or *Panama*; but, since that period, the commercial intercourse has been carried on by single vessels, called register ships, which sail round *Cape Horn*, and convey directly to the ports of *Chili* and *Peru* the merchandise which was formerly conveyed across the isthmus of *Darien* to *Panama*. In the harbour of *Panama* is a fine pearl fishery. This city is seated on a bay of the same name, 70 miles S. of *Porto Bello*. Lon. 80. 35 W. Lat. 8. 48 N.

PANARIA, one of the *Lipari* islands, in the Mediterranean, between *Lipari* and *Stromboli*. It is barren, and only five miles in circumference.

PANARIS. (*panaris*, corrupted from *paronychia*). See *PARONYCHIA*.

PANARMONION. (Greek.) A wind instrument used by the ancient Greeks, which (as far as we are able to collect from *Plato*, and the Commentaries of *Proclus* on that illustrious author), consisted of an assemblage of pipes, and resembled in some degree the modern organ. It is particularly worthy of notice, that every hole of these pipes, or imitation of pipes, as *Proclus* expressly calls them, was capable of emitting three different sounds, and in some circumstances more than three: from which we conclude that the ancients were better acquainted with the theory of natural harmonics than is generally supposed; several even of the moderns denying the possibility of the thing altogether. See *OCTAVE*.

PANATHENÆA, festivals in honour of *Minerva* the patroness of Athens, first instituted by *Erichtheus* or *Orpheus*, and called *Athenæa*; but *Theseus* afterwards renewed them, and caused them to be celebrated and observed by all the tribes of Athens, which he had united into one, and from which reason the festivals received their name. Some suppose that they are the same as the Roman *Quinquatria*, as they are often called by that name among the Latins. In the first years of the institution they were observed only during one day, but afterwards the time was prolonged, and the celebration was attended with greater pomp and solemnity. The festivals were two; the great *Panathenæa* or *μεγαλα*, observed every 5th year, and the lesser *Panathenæa*, *μικρα*, which were kept every 3d year, or rather annually. For a minute description of the manner of their celebration, the student is referred to *Lemprière's* larger dictionary, or *Potter's* Antiquities.

PANAX. *Ginseng*. In botany, a genus of the class polygamia, order diœcia. Herm.

umbel. Calyx five-toothed, superior; corol five-petalled; stamens five; styles two; berry two-seeded. Male: umbel. Calyx entire. Nine species; natives of America, China, and Australasia.

The cultivated species are as follows:

1. *P. quinquefolia*. Proper ginseng.
2. *P. trifolia*. Three-leaved panax.
3. *P. aculeata*. Prickly panax.

The first two sorts are increased by sewing the seeds on a hot-bed; the last by layers or cuttings.

Ginseng was formerly supposed to be confined to the mountains of Chinese Tartary: it is now, however, fully ascertained that the American panax quinquefolia is precisely the same.

The dried imported roots scarcely exceed the thickness of the little finger; are about three or four inches long, frequently forked, transversely wrinkled, of a horny texture, and both internally and externally of a yellowish-white colour. "To the taste it discovers a mucilaginous sweetness, approaching to that of liquorice, accompanied with some degree of bitterness, and a slight aromatic warmth, with little or no smell. It is far sweeter, and of a more grateful smell than the roots of fennel, to which it has by some been supposed similar; and it differs likewise remarkably from those roots in the nature and pharmacæutic properties of its active principles, the sweet matter of the ginseng being preserved entire in the watry as well as the spirituous extract; whereas that of fennel roots is destroyed or dissipated in the inspissation of the watry tincture. The slight aromatic impregnation of the ginseng is likewise, in good measure, retained in the watry extract, and perfectly in the spirituous."

By the Chinese it is regarded altogether as a panacea, or universal medicine: in Europe its medical virtues are regarded as trivial.

PANAY, one of the Philippine islands, between those of Paragoa and Negro. It is 250 miles in circumference, and the most populous and fertile of them all. It is watered by a great number of rivers and brooks, and produces a great quantity of rice. Iloila is the capital.

PANCAKE. *s.* (*pan* and *cake*.) Thin pudding baked in a fryingpan (*Mortimer*).

PANCARPUS, in Roman antiquity, a kind of show which the Roman emperors frequently exhibited to the people. The word is formed from the Greek *παν*, all, and *καρπος*, fruit. Whence the name was also given by the Athenians to a sacrifice wherein all kinds of fruits were offered. In this spectacle, the Circus, being all set over with large trees, represented a forest, into which the beasts being let from the dens under-ground, the people, at a sign given by the emperor, pursued, shot, and killed all they could lay hold of, which they afterwards carried away, to regale upon at home.

PANCRAS (St.), a village in Middlesex, now adjoining the N.W. of London. It has a church

dedicated to St. Pancras; and the churchyard is remarkable for having been the principal place of interment for the Roman catholics. At a public house near the church is a medicinal spring. Here is the Veterinary College, established in 1791, for the improvement of farriery, and the treatment of cattle in general.

PANCRATICAL. *a.* (*παν* and *κρατος*.) Excelling in all the gymnastic exercises (*Brown*).

PANCRATIUM (compounded of *παν*, all, and *κρατω*, I overcome), among the ancients, a kind of intermixed exercise, consisting of the lucra or wrestling, and the boxing or pugilate: but it differs in this, that as the athletes are not to seize the body, their hands are not armed with gauntlets, and give less dangerous blows. The pancratium was the third gymnastic exercise, and was not introduced till long after the others.

PANCRATIUM. Lily daffodil. Sea daffodil. In botany, a genus of the class hexandria, order monogynia. Corol superior, six-petalled; nectary campanulate, twelve-cleft; stamens placed on the nectary; stigma obtuse. Eleven species, natives of the West Indies or South America, a few of the south of Europe. Seven or eight of these are cultivated, the most of them as stove-plants.

PANCREAS. (*pancreas*, *πᾶνκρεας*; from *παν*, all, and *κρεας*, flesh; so called from its fleshy consistence.) A glandular viscus of the abdomen, of a long figure, compared to a dog's tongue, situated in the epigastric region under the stomach. It is composed of innumerable small glands, the excretory ducts of which unite and form one duct, called the pancreatic duct, which perforates the duodenum with the ductus communis choledochus, and conveys a fluid, in its nature similar to saliva, into the intestines. The pancreatic artery is a branch of the splenic. The veins evacuate themselves into the splenic vein. Its nerves are from the par vagum and great intercostal. The use of the pancreas is to secrete the pancreatic juice, which is to be mixed with the chyle in the duodenum. The quantity of the fluid secreted is uncertain; but it must be very considerable, if we compare it with the weight of the saliva, the pancreas being three times larger, and seated in a warmer place. It is expelled by the force of the circulating blood, and of the incumbent viscera in the full abdomen; as the liver, stomach, spleen, mesenteric and splenic arteries, and the aorta. Its great utility appears from its constancy, being found in almost all animals; nor is it refuted by the few experiments in which a part of it was cut out from a robust animal, without occasioning death; because the whole pancreas cannot be removed without the duodenum: for even a part of the lungs may be cut out without producing death, but they are not therefore useless. It seems principally to dilute the viscid cystic bile, to mitigate its acrimony, and to mix it with the food. Hence it is poured into a place remote from the cystic duct, as often as there is no gall-

bladder. Like the rest of the intestinal humours, it dilutes and resolves the mass of aliments, and performs every other office of the saliva.

PANCREATIC DUCT. See **DUCTUS PANCREATICUS.**

PANDANUS. Screw pine. In botany, a genus of the class diœcia, order monandria. Male: anthers sessile, inserted into the ramifications of the spadix. Female: stigmas two; fruit compound.

One species only, *P. odoratissimus*, sweet-scented screw pine: a native of Asia.—Branches issuing from large fusiform roots, descending to the ground and dividing; leaves clasping, imbricate in three spiral rows, spinous on the back and edges. It flowers in Asia during the rainy season, and is chiefly employed in making hedges. The perfume afforded by the tender white petals, of the male chiefly, afford the richest and most delightful fragrance of the vegetable world.

As a stove plant, it has a fine ornamental effect in our own country from its large spreading foliage. It may be best propagated by seeds sown in light earth in pots plunged into a tan-bed.

PANDARUS, a son of Læon, is remarkable for having broken the truce which had been agreed upon between the Greeks and Trojans. He also wounded Menelaus and Medes, and shewed himself uncommonly courageous. He was at last killed by Diomedes; and Æneas, who then carried him in his chariot, by attempting to revenge his death, nearly perished by the hand of the furious enemy.—2. A son of Alcanor, killed with his brother Bitias by Turnus.—3. A native of Crete, punished with death for being accessory to the theft of Tantalus. What this theft was is unknown. Some, however, suppose that Tantalus stole the ambrosia and the nectar from the tables of the gods, to which he had been admitted, or that he carried away a dog which watched Jupiter's temple in Crete, in which crime Pandarus was concerned, and for which he suffered. Pandarus had two daughters. See **CAMIRO** and **CLYTIA**.

PANDECTS, PANDECTÆ, in jurisprudence, the digest or collection, made by Justinian's order, of 534 decisions or judgments of the ancient lawyers, on so many questions occurring in the civil law; to which that emperor gave the force and authority of law, by the epistle prefixed to them. The word is Greek, *πανδεκται*, compounded of *πας*, all, and *δεχομαι*, *capio*, I take; i. e. a compilation, or a book containing all things. Though others, as Bartoli, will have it formed from *πας*, all, and *δεχομαι*; as if these books contained the whole doctrine of the law. The pandects consist of 50 books, and make the first part of the body of the civil law. They were denoted by two π; but the copyists taking those π for ff, the custom arose of quoting them by ff.

In the year 1137, the Pandects of Justinian, which had been brought by an Amalitan merchant from the East, fell into the hands of the

Pisans. Angelus Politianus believes this copy to be that which had been compiled by order of the emperor. However that be, it is certain that all other copies are taken from it, as being the most ancient. The Pisans having obtained their request from the emperor, carried the volumes to Pisa, and for near three centuries they were known by the name of the Pandectæ Pisanae.

PANDEMIC. (*pandemicus*; from *πας*, all, and *δemos*, the people). A synonym of epidemic. See **EPIDEMIC**.

PA'NDER. s. (from *pandanus*, the pimp in the story of *Troilus* and *Cressida*.) A pimp; a male bawd; a procurer (*Dryden*).

To PA'NDER. v. a. (from the noun.) To pimp; to be subservient to lust or passion (*Shakspeare*).

PANDERLY. a. (from *pander*.) Pimping; pimplike (*Shakspeare*).

PANDICULATION. s. (*pandiculans*, Latin.) The restlessness, stretching, and uneasiness that usually accompany the cold fits of an intermitting fever (*Floyer*).

PANDION, a king of Athens, son of Erichthon and Pasithea, who succeeded his father, B. C. 1437. He became father of Procne and Philomela, Erechtheus and Butes. During his reign there was such abundance of corn, wine and oil, that it was publicly reported that Bacchus and Minerva had personally visited Attica. He gave his daughter Procne in marriage to Tereus, king of Thrace, who had assisted him in a war with the Boeotians. The treatment which Philomela received from Tereus (see **PHILOMELA**) was the source of infinite grief to Pandion, and he died after a reign of 40 years.—There was also another Pandion, son of Cecrops 2d, who succeeded his father, B. C. 130. He was driven from his paternal dominions and fled to Pylas, king of Megara, who gave him his daughter Pelia in marriage, and resigned his crown to him. Pandion had four children. Ægeus, the eldest, afterwards recovered his father's kingdom. Some authors have confounded the two Pandions, and made Philomela and Procne the daughters, not of Pandion the 1st, but of Pandion the 2d. (*Ovid*, *Apollod.*, *Paus*).

PANDORA, the first mortal female that ever lived, according to Hesiod. She was made of clay by Vulcan, at the request of Jupiter, who wished to punish the impiety of Prometheus, by giving him a wife. When this woman of clay had received life, all the gods vied in making her presents. Venus gave her beauty, the Graces the power of captivating, Apollo taught her music, Mercury instructed her in eloquence, and Minerva gave her the most splendid ornaments.—From these presents received from the gods the woman was called Pandora, which intimates that she had received every necessary gift, *πας δωρον*. Jupiter after this gave her a box to present to the man who married her, and Mercury then conducted her to Prometheus. The artful mortal, sensible of the deceit, would not suffer

himself to be captivated by her charms. His brother Epimetheus was not possessed of the same prudence. He married Pandora, and upon opening the box which she presented him, there issued from it a multitude of evils, which dispersed themselves over the world, and which continue to afflict the human race. Hope only remained at the bottom, which alone renders troubles and sorrows less painful in life.

PANDORON, an ancient stringed instrument resembling a lute, and the strings of which are of brass. Its frets are of copper, like those of the cistrum; its back is like that of a guitar; and the rims of its table, like those of its ribs, are cut into semicircles.

PANDROSOS, a daughter of Cecrops, king of Athens, sister to Aglauros and Herse. She was the only one of the sisters who had not the fatal curiosity to open a basket, in which was Erichthonius, and which Minerva had entrusted to their care: for which sincerity a temple was raised to her, near that of Minerva, and a festival instituted in her honour, called Pandrosia.

PANDURATE LEAF. PANDURA FORM LEAF. In botany. (Pandura, a musical instrument of the guitar kind, in Mersennus) folium. A guitar-shaped leaf. (Viol-shaped, Ray hist. 174.) The French call it *en forme de violon*.—Oblongum, inferne latius, lateribus, coarctatum. Philos. Bot. Oblong, broader, below, contracted on the sides. In Delin. Pl. the explanation is differently worded. Oblongum, lateribus: oblongum, lateribus inferne coarctatum. Oblong, contracted below at the sides. The former appears most correct. It is exemplified in *rumex pulcher*, and *convolvulus panduratus*.

PANE. *s.* (*paneau*, French.) 1. A square of glass (Pope). 2. A piece mixed in variegated works with other pieces (Donne).

PANEGYRIC, an oration in praise of some extraordinary thing, person, or virtue. The name is Greek, *πανηγυρις*; formed of *παν*, all, and *αγυρις*, I assemble; because anciently held in public and solemn assemblies of the Greeks, either at their games, their feasts, fairs, or religious meetings. To make their panegyrics the more solemn, the Greeks used to begin with the praises of the deity in whose honour the games, &c. were celebrated; then they descended to the praise of the people or country where they were celebrated; then to the princes or magistrates who presided at them; and at length to the champions, especially the conquerors, who had gained the prizes in them.

PANEGYRICAL. *a.* 1. Dealing in panegyrics. 2. Communicating or exhibiting panegyrics; laudatory.

PANEGYRIST. *s.* (*panegyriste*, Fr.) One that writes praise; encomiast (Camden).

PAN'EL. *s.* (*panellum*, Lat. *paneau*, Fr.) 1. A square, or piece of any matter inserted between other bodies (Addison). 2. A schedule or roll, containing the names of such jurors,

as the sheriff provides to pass upon a trial (Cowell).

PANG. *s.* (*bang*, Dutch, uneasy.) Extreme pain; sudden paroxysm of torment (Derham).

To PANG. *v. a.* (from the noun.) To torment cruelly (Shakspeare).

PANGÆUS, in ancient geography, a mountain of Thrace, anciently called Mons Caraminus, and joined to Mount Rhodope, near the sources of the river Nestus. On this mountain Lycurgus, the Thracian king, was torn to pieces, and Orpheus called the attention of the wild beasts and of the mountains and woods to listen to his song.

PANGOLIN, a species of **MANIS**, which see.

PANJAB, a country of Hindustan Proper, being that watered by the five eastern branches of the Indus. It was the scene of Alexander's last campaign, and the termination of his conquests. It forms a square of 250 miles, and includes the whole of Lahore, and a great part of Moultan Proper. To the lower part of Moultan it is flat and marshy, and inundated by the periodical rains which fall between May and October.

PAN'IC. *s.* Ill grounded terror or fright. See **PAN**.

PANICLE. In botany. (From *panica*, *πανικα*, coma; or rather from *panus*, the wool about the quill in the shuttle.) Fructification sparsa in pedunculis diverse subdivis. A fructification, or species of inflorescence, in which the flowers or fruits are scattered on peduncles variously subdivided. As in oats and some of the grasses.

PANICLE (Heaped). Having great abundance of flowers.

PANICLE (Dense or close). A higher degree of the preceding. Or rather, having the flowers close as well as abundant.

PANICLE (Spiked). Approaching in form to a spike: as in several of the grasses, which are commonly called spiked grasses.

PANICLE (Contracted). A greater degree of the foregoing.

PANICLE (Coarctate). A squeezed panicle. Having the pedicels extremely near to each other.

PANICLE (Patent). A spreading panicle. Having the pedicels spreading out so as to form an acute angle with the stalk.

PANICLE (Diffuse). A diffused panicle. Having the pedicels spreading out more and irregularly.

PANICLE (Divaricate). A divaricating panicle. Spreading out still more, at an obtuse angle with the stalk.

PANICULATE LEAF. A panicked stem. Having branches variously subdivided.

PANICULATE GRASSES. Panicked grasses. Having their fructifications in a panicle.

PANICUM. Panic grass. In botany, a genus of the class triandria, order digynia. Calyx three-valved, one-flowered; the third valve very small; seed invested with the permanent hardened corol. Eighty-two species scattered

over the globe; of which four are common to our own corn-fields: of these some are spiked, and others panicked.

Those common to our own fields are as follows:

1. *P. verticillatum*, with whorled spike and diffuse culms. Corn-fields.

2. *P. crus galli*: spike doubly-compound; glume awned, hispid. Wet fields. There is a variety with the awns ten times as long as the glumes.

3. *P. sanguinale*. Finger-like spikes; sheaths of the leaves dotted. Corn-fields.

4. *P. dactylon*. Finger-like spikes; and creeping shoots. Sandy shores.

The two following are also worth particularising:

5. *P. Italicum*. Spike compound; culm simple; leaves alternate, flat, striate, reflected. It is from this plant the Italians obtain their millet seed; whence its specific name; for it is a native of the Indies.

6. *P. miliaceum*. Millet panicum. Panicle loose, flaccid; leaves with hairy or glabrous sheaths; glumes mucronate, nerved; culm channelled, branched, leafy. The seeds are the common millet seeds of our own shops. The plant is indigenous to India.

PANKE. In botany, a genus of the class enneandria, order monogynia. Calyx four-cleft; corol campanulate, four-cleft; capsule two-valved, one-seeded. Two species, natives of Chili.

PANNADE. See **CURVET**.

PANNANACH WELLS, a village in Aberdeenshire, situate a little below the waterfall, called the Lin of Dee, in the valley of Glenmuick. It is noted for its mineral waters; and has a lodge for the accommodation of the company that frequent this place in summer.

PANNELS OF A SADDLE, two cushions, or bolsters, filled with cow, deer, or horse-hair, and placed under the saddle, one on each side, so as to touch the horse's body, and prevent the bows from galling or hurting his back.

PANNICLE. (*panniculus*, dimin. from *pannus*, a woven cloth) *Panniculus carnosus*; carnosous membrane, a thin muscular covering attached to the skin in brute animals, by means of which they have the power of shaking it so as to throw off any thing which adheres to the hairy coat and occasions uneasiness. Gibson's account of this superficial muscle is given under the article **CUTIS**. The fatty panicle is synonymous with **CELLULAR MEMBRANE**, which see.

PANNIER *s.* (*panier*, French.) A basket; a wicker vessel, in which fruit, or other things, are carried on a horse (*Addison*).

PANNIPUT, a town of Hindustan Proper, situate in an extensive plain between the cities of Delhi and Sirhind.

This plain is celebrated for a battle, in 1761, between an army of 200,000 Mahrattas, and Abdallah, sultan of Candahar, at the head of 150,000 Mahometans, in which the former were totally defeated. Panniput is 72 miles

N.W. of Delhi. Lon. 76. 45 E. Lat. 29. 15 N.

PANNONIA, a large country of Europe, bounded on the east by Upper Mœsia, south by Dalmatia, west by Noricum, and north by the Danube. It was first invaded by J. Cæsar, and conquered in the reign of Tiberius. Philip and his son Alexander some ages before had successively conquered it. Its chief city was Sirmium.

PANOMPHEUS, a surname of Jupiter, either because he was worshipped by every nation, or because he heard the prayers addressed to him, or because the rest of the gods derived from him their knowledge of futurity. (*πανς, omnis, ομης, vox.*)

PANOPE, or **PANOPEA**, one of the Nereides, whom sailors generally invoked in storms. Her name signifies giving every assistance, or seeing every thing.

PANOPHOBIA. (*panophobia, παναφοβια*; from *παν*, all, and *φοβος*, fear.) That kind of melancholy which is attended with groundless fears. The moderns consider it as symptomatic.

PANOPLY. *s.* (*πανοπλια*.) Complete armour (*Milton*).

PANOPODIS, the city of Pan, a town of Egypt, called also Chinmis. Pan had there a temple, where he was worshipped with great solemnity.

PANORAMA (from *παν*, all, and *οραμα*, a sight, of *ωραμαι*, perf. pass. of *οραω*, to see), in the art of painting, a representation of a town, a country, or any interesting scenery, upon the concave surface of a hollow cylinder. This ingenious extension of the art of painting, by means of which the spectator is thrown in the centre of the scene (a thing the possibility of which has been denied by many artists not thirty years ago), is the invention of the late Mr. Barker; whose panoramical pictures of Spithead, Edinburgh, Gibraltar, &c. have deservedly excited great admiration, and been warmly patronized. The son of the inventor still continues, with great zeal and talent, to exhibit to the public fresh pictures of this kind every season in Leicester square.

PANORMO, a town of Turkey in Europe, in Albania, situate on a gulf of the Adriatic, opposite the island of Corfu, 45 miles S.S.E. of Valona. Lon. 20. 2 E. Lat. 40. 0 N.

PANORPA, in zoology, a genus of the class insecta, order neuroptera. Mouth lengthened into a cylindrical, horny proboscis; feelers four, nearly equal; stemmata three; antennae filiform, longer than the thorax; tail of the male armed with a chelate appendage; of the female unarmed. Nine species, scattered over the globe; of which *P. communis* is the only one indigenous to our own country: its wings are of equal length, spotted with black, and transparent; body longish: it is frequently seen in our meadows during the early part of summer. *P. coa*, with erect wings, the lower ones nearly linear and very long, is a native of the Greek islands. It is larger than the preceding, and its wings are also beautifully spotted, or banded with brown and yellow.

PANSIE, or PANSY, in botany. See VIOLA.

To PANT. *v. n.* (*panter*, old Fr.) 1. To palpitate; to beat as the heart in sudden terror, or after hard labour (*Crashaw*). 2. To have the breast heaving, as for want of breath (*Dryden*). 3. To play with intermission (*Pope*). 4. To long; to wish earnestly (*Pope*).

PANT. *s.* (from the verb.) Palpitation; motion of the heart (*Shakspeare*).

PANTALARIA, an island in the Mediterranean, between Sicily and the coast of Tunis, 17 miles in circumference. It abounds in cotton, fruits, and wine, and is subject to the king of Naples. Lon. 12. 31 E. Lat. 36. 55 N.

PANTÆNUS, a stoic philosopher, born in Sicily (though some have erroneously supposed him to be a Hebrew) about the beginning of the reign of Commodus. He presided over the celebrated school of Alexandria, where, from the time of St. Mark, the founder of that church, they had always a divine that was eminent for his learning and piety to explain the holy scriptures, and to instruct them in human learning. This employment he was obliged to leave; for, when the Indians required of Demetrius, bishop of Alexandria to send them one to instruct them in Christianity, he sent Pantænus, who undertook the mission with joy, and behaved himself very properly in it. We are told, that the Indians had been tinctured with Christianity by St. Bartholomew the apostle; and that Pantænus met with the Hebrew original of St. Matthew's gospel, which the apostle had left there. St. Jerome says that Pantænus brought it with him; and that it was, in his time, preserved in the library of Alexandria. But we suspect St. Jerome to be mistaken in this respect. When Pantænus returned to Alexandria he reassumed the government of the school of that city, which, it is probable, he had, during his absence, committed to the care of St. Clement, a presbyter of Alexandria. He explained the scriptures publicly under the reign of Severus and Antoninus Caracalla; and was, in St. Jerome's opinion, more serviceable to the church by his discourses than by his writings. He published some commentaries upon the Bible, which are lost.

PANTALOON, a sort of garment consisting of breeches and stockings all of one piece; said to have been first introduced by the Venetians.

PANTALOON, on the theatre, is a buffoon or masked person, who performs high and grotesque dances, and shows violent and extravagant postures and airs. The word is likewise used for the habit or dress these buffoons usually wear; which is made precisely to the form of their body, and all of a piece from head to foot. And hence those who wear a habit of this kind, for conveniency under their other clothes, are called pantaloons of Venice.

PANTHEA, the wife of Abradates, cele-

brated for her beauty and conjugal affection. She was taken prisoner by Cyrus, who refused to visit her, not to be ensnared by the power of her personal charms. She killed herself on the body of her husband, who had been slain in a battle. (Vid. ABRADATES.)

PANTHEA, in antiquity, were single statues, composed of the figures, or symbols, of several different divinities together. Father Joubert, who calls them panthea, and who has remarked them sometimes on medals, says their heads are most commonly adorned with the symbols or attributes belonging to several gods.

PANTHEISM, a philosophical species of idolatry leading to atheism, in which the universe was considered as the supreme God. Who was the inventor of this absurd system is, perhaps, not known; but it was of early origin, and differently modified by different philosophers. Some held the universe to be one immense animal, of which the incorporeal soul was properly their God, and the heavens and earth the body of that God; whilst others held but one substance, partly active and partly passive: and therefore looked upon the visible universe as the only Numen. The earliest Grecian Pantheist of whom we read was Orpheus, who called the world the body of God, and its several parts his members, making the whole universe one divine animal. According to Cudworth, Orpheus and his followers believed in the immaterial soul of the world; therein agreeing with Aristotle, who certainly held that God and matter are coeternal; and that there is some such union between them as subsists between the souls and bodies of men. (See METAPHYSICS.) In the ancient Orphic theology, we are taught that this universe, and all things belonging to it, were made within God; that all things are contained together in the womb of God; that God is the head and middle of all things; that he is the basis of the earth and heaven; that he is the depth of the sea, the air we breathe, the force of the untameable fire; that he is the sun, moon, and stars; that there is one divine body; for, *Πάντα γὰρ ἐν μὲν γὰρ ταῖς ἀνθρώποις κεῖται*, "all these things lie in the great body of God."—But further, to prove that the most ancient Greek philosophers resolved all things into God, and made God all, we shall cite a most remarkable passage from Plutarch's Defect of Oracles. "Whereas there are two causes of all generations, the divine and the human, the most ancient theologers and poets attended only to the more excellent of these two; resolving all things into God, and pronouncing this of them universally; *Ζεὺς ἀρχὴ, Ζεὺς μέσος, Διὸς δ' ἐν παντί περὶ πάντα*, that God is both the beginning and middle, and that all things are out of God; insomuch, that they had no regard at all to the other natural and necessary causes of things; but on the contrary, their juniors, who were called naturalists, deviating from this most excellent and divine principle, placed in all bodies their passions, collisions, mutations, and commixtures." See SPINOZISM.

PANTHEON (Πανθεον, thus named from *παν*, all, and *θεος*, God), in architecture, a temple, or church, of a circular form; dedicated to all the gods, or to all the saints.

The Pantheon of ancient Rome is of all others the most celebrated, and that whence all the rest take their names. It was built by Agrippa, son-in-law of Augustus, in his third consulate, twenty-five years before Christ; though several antiquarians and artists have supposed that the Pantheon existed as long ago as the commonwealth, and that Agrippa only embellished it and added the portico. To this purpose they allege the authority of Dion Cassius, who, speaking of Agrippa, says, he also finished or perfected the Pantheon.

It was dedicated by him to Jupiter Uitor, Jupiter the Revenger; and had the name Pantheon, on account of the great number of statues of the gods ranged in seven niches all round it; and because built of a circular form, to represent heaven, the residence of the gods. It has but one door, and one window, receiving all its light from the top of its dome. It is one hundred and forty-four feet diameter within, and just as much in height, and of the Corinthian order. Before each niche are two columns of antique yellow marble fluted, and of one entire block. The whole wall of the temple, as high as the grand cornice inclusive, is eased with divers sorts of precious marble in compartments: and the frieze is entirely of porphyry.

The eruption of Vesuvius, in the reign of Tiberius, damaged the Pantheon very considerably: but it was successively repaired by Domitian, Adrian, and Septimius Severus: and it subsisted in all its grandeur till the incursion of Alaric, in the time of Honorius: on this occasion it was stripped of several of its statues and ornaments of gold and silver. About thirty-nine years after this, Genseric, king of the Vandals, took away part of its marbles and statues: at length pope Boniface IV. obtaining this Pantheon of the emperor Phocas, converted it into a church, without any alteration in the building; and dedicated it to the Virgin, and all the martyrs. And it still subsists at Rome under the title of *Noire Dame de la Rotonda*. However in 655, Constantius II. stripped it of its inside and outside brazen coverings, which he transported to Syracuse.

There was also at Rome another Pantheon, dedicated to Minerva, as the goddess of Medicine. It was in the form of a decagon, and the distance from one angle to another measured 22½ feet. Between the angles there were nine chapels of a round figure, designed for so many deities; and over the gate there was a statue of Minerva. The Pantheon of Athens was in many respects little inferior to that of Rome, built by Agrippa. The Greek Christians converted it into a church, dedicated to the Virgin, under the name of Panegia. The Turks changed it into a mosque.

The Pantheon of Nismes was a temple in that city, wherein were twelve niches, or sta-

tues, supposed to have been destined for the twelve great gods.

In the Escorial is a magnificent chapel, called Pantheon, thirty-five feet in diameter, and thirty-eight high, from the pavement, which is of marble and jasper inlaid. The whole inside of the chapel is of black marble, except the luthern, and some ornaments of jasper, and red marble.

In this chapel are deposited the bodies of the kings and queens: there are only places made for twenty-six: eight of which are already filled.

PANTHEUS, or **PANTHUS**, a Trojan, son of Othryas, the priest of Apollo. When his country was burnt by the Greeks, he followed the fortune of Æneas, and was killed.

PANTHER, in mastiology. See **FELIS**.

PANTILE, *s.* a gutter tile.

PANTINGLY, *ad.* (from *panting*.) With palpitation (*Shakspeare*).

PANTLER, *s.* (*panetier*, Fr.) The officer in a great family, who keeps the bread (*Shak.*).

PANTOFLE, *s.* (*pantoufle*, French.) A slipper (*Peacham*).

PANTOLOGIA, **PANTOLOGY**, (from *παν*, *παντος*, every thing, and *λογος*, treatise or instruction.) A work of universal instruction, or science: a cyclopædia or encyclopædia.

PANTOMIME, *παντομιμος*, among the ancients, a person who could imitate all kinds of actions and characters by signs and gestures without speaking. The pantomimes made a part in the theatrical entertainments of the ancients; their chief employment was to express, in gestures and action, whatever the chorus sung, changing their countenance and behaviour as the subject of the song varied. They were very ancient in Greece, being derived from the heroic times, according to some; but however this may be, they were certainly known in Plato's time. In Rome it was so late as the time of Augustus before they made their appearance. As to their dress, it was various, being always suited as near as possible to that of the person they were to imitate. The crocata was much used among the Roman pantomimes, in which and other female dresses they personated women.

We have this account of them in Gibbon's history. "The pantomimes, who maintained their reputation from the age of Augustus to the sixth century, expressed, without the use of words, the various fables of the gods and heroes of antiquity; and the perfection of their art, which sometimes disarmed the gravity of the philosopher, always excited the applause and wonder of the people. The vast and magnificent theatres of Rome were filled by 3000 female dancers, and by 3000 singers, with the masters of the respective chorusses. Such was the popular favour which they enjoyed, that in a time of scarcity, when all strangers were banished from the city, the merit of contributing to the public pleasures exempted them from a law which was strictly executed against the professors of the liberal arts."

Pantomimes are still very common in England: they differ indeed in some respects from those of antiquity; but they retain the name, and like these they consist in the representations of things merely by gestures.

PANTON-SHOE, or **PANTABLE-SHOE**, in farriery, an old invention, contrived for receiving narrow and hoof-bound heels. Its sponges are much thicker on the inside than on the outside, so that the part which rests upon the horn, or hoof, runs sloping to the end, that the thickness of the inside of the shoe may bear up the heel, and throw or push it to the outside. Panton-shoes are described by Guillet to be proper for horses that have false quarters.

PANTRY. *s.* (*paneterie*, Fr.) The room in which provisions are repositied.

PANUCO, a province of New Spain, in the audience of Mexico. The capital, of the same name, is a bishop's see, and is situated on the river Panuco, 170 miles N. by E. of the city of Mexico. Lon. 98. 5 E. Lat. 23. 0 N.

PANZERA. In botany, a genus of the class decandria, order monogynia. Calyx one-leaved, with a four-parted border; petal one, roundish, lateral, convolute at the base; filaments thickened and bearded at the base, five of them barren; legume doubtful. A Guiana tree, sixty feet high.

PAOLI (Pascal), a very celebrated Corsican, was born in 1726, being the son of Giocinto Paoli, a man of considerable weight and influence in that island, previously to the year 1735. Soon after that period the various revolutions his country underwent obliged him to withdraw to Naples; whence in the year 1755 he sent his son Pascal Paoli to assist his countrymen in regaining their liberty. Pascal had no sooner arrived than he was made, though but 29 years old, commandant-general of the island. He established a regular administration among the undisciplined Corsicans, and formed a considerable body of regular troops. He instituted an university, with the view of softening the manners, by cultivating the sciences. Pascal supported the Corsicans for some time against the gold of the Genoese, and the arms of France; but at length the latter prevailed, and Pascal was compelled to retire to England, where he arrived in 1769, and took up his abode in the capital.

A striking display of the character of the legislator and of the subject is given in the following anecdote, related by Paoli to Mr. Boswell, when he visited Corsica: "A criminal," said he, "was condemned to die. His nephew came to me with a lady of distinction, that she might solicit his pardon. The nephew's anxiety made him think that the lady did not speak with sufficient force and earnestness. He therefore advanced, and addressed himself to me, 'Sir, is it proper for me to speak?' as if he felt that it was unlawful to make such an application. I bid him go on. 'Sir,' said he, with the deepest concern, 'may I beg the life of my uncle? If it is granted, his relations will make a gift to the state of a thousand zechins.

We will furnish fifty soldiers in pay during the siege of Furiani. We will agree that my uncle shall be banished, and will engage that he shall never return to the island. I knew the nephew to be a man of worth, and I answered him: You are acquainted with the circumstances of this case. Such is my confidence in you, that if you will say that giving your uncle a pardon would be just, useful, or honourable for Corsica, I promise you it shall be granted. He turned about, burst into tears, and left me, saying, 'Non vorrei vendere l'onore della patria per mille zechini. I would not have the honour of our country sold for a thousand zechins.' And his uncle suffered." *Boswell's Corsica*, page 312.

After a residence of twenty years in England, during which his country continued under the sovereignty and dominion of France, new prospects of patriotic utility opened to the exiled chief, and invited him once more to authority and command. The extraordinary revolution which had begun in France, and had, in a short period, changed the whole system of its government and policy, extended its influence to its remotest territories, and rekindled the embers of liberty in Corsica. The simple circumstance of a Frenchman appearing at Bastia in the year 1789, with the national cockade in his hat, revived in the breasts of the Corsicans the almost extinguished spark, which was instantly fanned into a blaze in every part of the country, and wrought a complete revolution, without the expence of one drop of human blood. Immediately after this, the national convention passed a decree, in which the island was recognized as a department of France, and therefore entitled to its privileges; and they proceeded to reorganise its government upon the principles of the French constitution. The restoration of Paoli was regarded as an indispensable part of the measures to be adopted, and an application to this effect was directed to him, both from the National Convention and his countrymen. How great soever his satisfaction might have been to behold the prospect of emancipation and liberty which opened to his long-oppressed country, he hesitated to return. He considered it as still forming a part of France, and he could but ill reconcile his great mind to resume his station at the head of its affairs, while his government was to be subject to the control of a foreign power. But the earnest intreaties of his grateful countrymen, from whose hearts the interval of twenty years could not obliterate their deep sense of their obligations to his wisdom and valour, supported by the warm solicitations of the French assembly, finally prevailed. He resigned his pension, with feelings and acknowledgments to the generous people from whom he had enjoyed it, which reflected the highest honour upon the breast where every virtue seemed to be concentrated, and embarked once more for his native shores. On the 23d of April 1790, attended by deputies from Corsica, he presented himself at the bar of the national assembly at Paris. He was greeted on his entrance by

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shouts of rapturous applause: such was the enthusiasm communicated by the appearance of the great advocate of freedom to the breasts of those who were themselves but newly liberated from the shackles of oppression. The patriotic chief addressed the assembly with dignified composure, and impressive eloquence, in a speech expressive of the happiness he felt, after twenty years of exile from his country, to behold it once more about to be restored to the enjoyment of the sacred privileges of freedom, and of his readiness cheerfully to co-operate with the ruling powers of France, to render that enjoyment solid and permanently advantageous to his fellow citizens. Paoli now took the necessary oaths as a subject of the republic, and hastened to take upon himself the high and honourable charge to which he was called not only by Corsica and France, but by the unanimous voice of all Europe.

Hardly had he received the gratulations of his country on his return, and entered upon the duties of his new trust, before he found the whole of his prospects darkened and interrupted by the changes which were daily taking place in France, by the alternate ascendancy of different factions, and ultimately by the condemnation and execution of the king. The struggles of contending parties which at this time convulsed the whole of France considerably affected public opinion in Corsica. In some of the pieves, or departments, the violence of party spirit broke out into open tumult, and it was soon discovered that there was a disposition in a very great part of the inhabitants to avail themselves of the unsettled state of politics in the mother country to break their connection with it, and to shake off the yoke by which they were subjugated. To this party Paoli, after seriously considering the precarious condition of the island and of his government while subjected to a country which was itself the theatre of constant disorder, and the prey of turbulent factions, gave his powerful and commanding sanction. He was on this occasion joined by all the clergy of the country, who formed themselves into a military corps under the denomination of the sacred band. There was at this time a considerable body of French troops stationed in the different garrisoned towns. Finding that Paoli was taking measures to break from his allegiance, and being joined and instigated by some Corsican families who were at enmity with him, they formally took the field against him; but the force which he had been able to collect by the popularity of his cause and the universal attachment to his person was so great, that he was not long in deciding the contest and vanquishing his adversaries. He was then invested with his original dignities of president of the consulta, and commander in chief of the island, dignities which he had held with the highest honour before his country had become a province of France. The national assembly were greatly enraged at this counter-revolution, and alienation of Corsica from its sovereignty and dominion: they denounced Paoli to be a rebel,

set a price upon his head, passed a decree to cashier the consulta or national council, which he had re-established, and annulled, at least in words, which was all they had the power to effect, the authority which had been confided to him. Paoli was, however, too much beloved by his countrymen to be betrayed by them, and they were likewise little disposed to attend to the mandates or tremble at the denunciation of a government too distracted and impotent to do them immediate injury. Paoli saw nevertheless that it would not be possible to resist with success the power of France when once seriously directed to reduce the island to subjection; and well knew that a voluntary submission would not be received without being attended with fatal consequences to many individuals who had been instrumental in effecting its independence; he therefore resolved upon an alternative which appeared to him to promise the greatest security, and to hold out the fairest prospect of future tranquillity and happiness to his country, which was to obtain from his countrymen a voluntary surrender of the island to Great Britain. With this view he addressed a letter to them, dated from Furiani, May 1st, 1794, in which he explained at large his views and wishes, and advised that a meeting of the deputies should be held at Corte on the eighth of June following, to take into serious consideration the propriety of concluding the union which he proposed to them. In the conclusion of this letter he writes; "With respect to myself, my dearly beloved countrymen, after having devoted every moment of my life to your happiness, I shall esteem myself the happiest of mankind, if, through the means I have derived from your confidence, I can obtain for our country the opportunity of forming a free and lasting government, and of preserving to Corsica its name, its unity and independence, whilst the names of the heroes who have spilt their blood in its support and defence will be, for future generations, objects of noble emulation, and grateful remembrance." This assembly of the deputies took place on the 14th of June. It was opened by an eloquent speech from Paoli, who took a review of the different events which had transpired, and the measures which had been adopted by him since the separation of the last general consulta in May 1793, explained the purpose for which they had been convoked, and directed them to the weighty measures on which they would have to deliberate. After voting their unanimous thanks to Paoli, and expressing their full approbation of his conduct, they proceeded to declare "the separation of Corsica from France, and with the same unanimity, and with the strongest demonstrations of joy, voted the union of Corsica to the crown of Great Britain:" and it is added, "that no national act was ever sanctioned by a more unanimous proceeding on the part of those who were authorised to do it, or by a more universal approbation, amounting to enthusiasm, on the part of the people." All the proceedings on this occasion were con-

ducted with the strictest order and propriety; no measure being adopted in haste, or settled without full and dispassionate consideration. The necessary previous arrangements being formally concluded, the government was transferred to the English commissioner, sir Gilbert Elliot (now lord Minto), who took possession of it as viceroy for the king of Great Britain. Paoli had now resigned the dignities of office, and reduced himself to the rank of a private citizen. What his intentions might have been with regard to his future residence, whether he meant to pass the remainder of his days in his native country or elsewhere, it is now impossible to say; but it is stated that a coolness which, from some cause or other, had unfortunately taken place between him and the English viceroy, at once determined him to quit Corsica; and he returned to the hospitable shores of that country where he had before experienced the kindest reception, and enjoyed a long interval of comfort and happiness. Having had the misfortune to lose the bulk of his property by the failure of a house at Leghorn, to which he had entrusted it, he was unable, on his return to London, to command the conveniences which his income had before placed within his power, and obliged for some time to live in the most private manner in an obscure part of the town. There is reason to believe, however, that when his pecuniary circumstances became known, prompt measures were adopted to improve them, and that his pension was again restored, and continued to him to the last.

The eventful life of this truly great man, great in all those noble and benign qualities which impart dignity and honour to the living, and consecrate the memory of the dead, was closed, after a short but painful illness, on Thursday the fifth of February, 1807, aged 81 years; and he was buried on Friday the thirteenth of the same month, without pomp or ostentation, in the burying ground of St. Pancras. Though dead, his name shall continue to exist while virtue has a friend. Future generations will contemplate his character with wonder and veneration, and Paoli shall be enrolled among those benefactors of their kind who have immortalized themselves by transcendent actions of benevolence.

The following is an eulogium of no mean worth, drawn by the masterly pen of Voltaire, and occasioned by the consideration of this part of Paoli's conduct. "Quelque chose qu'on ait dit de lui (Paoli) il n'est pas possible que ce chef n'eut de grandes qualités. Etablir un gouvernement regulier chez un peuple qui n'en voulait point; réunir sous les mêmes lois des hommes divisés et indisciplinés; former à la fois des troupes réglées, et instituer une espèce d'université qui pouvait adoucir les mœurs, établir des tribunaux de justice, mettre un frein à la fureur des assassinats et des meurtres, polir la barbarie, se faire aimer en se faisant obéir; tout cela n'était pas assurément d'un homme ordinaire. Il ne put faire assez, ni pour rendre la Corse libre, ni pour y regner

pleinement; mais il en fit assez pour acquérir de la gloire." *Voltaire, Siecle de Louis XV. Article De la Corse.*

PA-OOM, one of the New Hebrides, in the S. Pacific Ocean, to the S. of Malicollo. Lon. 168. 28 W. Lat. 16. 30 S.

PAO-TING-FOU, a city of China, the most considerable in the province of Pei-cheli, next to that of Peking. Its district contains three cities of the second, and 17 of the third class. It is 60 miles S. by W. of Peking.

PAP. *s.* (*papa*, Italian; *pappe*, Dutch; *papilla*, Lat.) 1. The nipple; the dug sucked (*Spenser*). 2. Food made for infants, with bread boiled in water (*Donne*). 3. The pulp of fruit (*Ainsworth*).

PAPA'. *s.* (παππῆς.) A fond name for father, used in many languages (*Swift*).

PAPA, a strong town of Lower Hungary, in the county of Vespri, taken from the Turks, in 1683, after the raising of the siege of Vienna. It is seated on a mountain, near the river Marchaltz, 45 miles W. of Buda. Lon 18. 20 E. Lat. 47. 26 N.

PA'PACY. *s.* (*papauté*, Fr. from *papa*, the pope.) Popedom; office and dignity of bishops of Rome (*Bacon*).

PA'PAL. *a.* (*papal*, Fr.) Popish; belonging to the pope; annexed to the bishopric of Rome (*Raleigh*).

PA'PAVER. Poppy. In botany, a genus of the class polyandria, order monogynia. Calyx two-leaved; corol four-petalled; stigma radiate; capsule superior, discharging its seeds by pores under the permanent stigma. Twelve species, chiefly natives of Europe, six of the corn-fields and wastes of our own country: one or two of the East. Of these some have bristly, others glabrous capsules.

The species cultivated are as follow:

1. P. somniferum. White poppy. Calyx and capsules glabrous: leaves clasping the stem, cut, glaucous; supposed to be originally of Asia; but now found wild in the south of Europe and the wastes of our own country.

There are several varieties differing in the colour and multiplicity of their petals which are preserved in gardens for ornament. It is the single-flowered sort that is chiefly cultivated for use both in our own country and in India.

It is from the heads of this plant that opium is obtained. The seeds of the plant are for this purpose sown at Bahar in the month of October and November, at about eight inches distance, and well watered till the plants are about half a foot high; when they are covered with a stimulating compost of dung, ammoniacal earth and ashes; after which, just before the flowers appear, they are again watered profusely till the capsules are half grown, at which time the opium is collected, for when fully ripe they yield but little juice. Two longitudinal incisions from below upwards, without penetrating the cavity, are made at sun-set for three or four successive evenings; in the morning the juice is scraped off with an iron scoop, and worked in an iron pot in the sun's heat till it is of a

consistence to be formed into thick cakes of about four pounds weight; these are covered over with the leaves of poppy, tobacco, or some other vegetable, to prevent their sticking together, and in this situation they are dried. See OPIUM.

The heads of this plant are also directed for medicinal use in the form of fomentation, and in the syrupus papaveris albi, a useful anodyne, which often succeeds in procuring sleep where opium fails; it is, however, more especially adapted to children. The seeds of this species of poppy contain a bland oil, and in many places are eaten as food; as a medicine, they have been usually given in the form of emulsion in catarrhs, stranguries, &c.

2. *P. rhoeas*. Corn or red poppy. Capsules glabrous, nearly globular; stem many-flowered, bristly; all the bristles spreading horizontally; leaves pinnatifid and cut. Corn-fields: flowers from June to August.

The heads of this species, like those of the somniferum, contain a milky juice of a narcotic quality; from which an extract is prepared, that has been successfully employed as a sedative. The flowers have somewhat of the smell of opium, and a mucilaginous taste, accompanied with a slight degree of bitterness. A syrup of these flowers is directed in the London pharmacopœia, which has been thought useful as an anodyne and pectoral, and is therefore prescribed in coughs and catarrhal affections.

3. *P. Cambricum*. Welch poppy. Capsules glabrous, oblong, ending in a beak; stem many-flowered with a few ascending hairs; leaves pinnate and cut; flowers large and yellow, appearing in June. Indigenous to the stony mountains of Great Britain, and especially of Wales.

4. *P. orientale*. Oriental poppy. Capsules glabrous, globular; stems one-flowered, leafy, rough, with close-pressed bristles; leaves pinnate and serrate, with bristly hairs: flower red. A native of Armenia; and flowers with us in May.

PAPAVEROUS. *a.* (*papavereus*, from *papaver*, Lat.) Resembling poppies (*Brown*).

PAPAW. The fruit of the carica papapa of Linnéus, a native of both Indies, and Guinea coast of Africa. When the roundish fruit are nearly ripe, the inhabitants of India boil and eat them with their meat, as we do turnips. They have somewhat the flavour of a pompon. Previous to boiling, they soak them for some time in salt and water, to extract the corrosive juice, unless the meat they are to be boiled with should be very salt and old, and then this juice being in them will make it as tender as a chicken. But they mostly pickle the long fruit, and thus they make no bad succedaneum for mango. The buds of the female flowers are gathered, and made into a sweetmeat; and the inhabitants are such good husbands of the produce of this tree, that they boil the shells of the ripe fruit into a repast, and the insides are eaten with sugar in the manner of melons.

PAPAW TREE (North American), a species of *ANNONA*, which see.

PAPER, a thin flexible leaf, usually white, artificially prepared of some vegetable substance, chiefly to write upon, with ink.

The word is formed from the Greek *παπυρος*, *papyrus*, the name of an Egyptian plant, called also *βιβλος*, *biblus*, whereon the ancients used to write.

Various are the materials, on which mankind in different ages and countries have contrived to write their sentiments; as on stones, bricks, the leaves of herbs and trees, and their rinds or barks; also on tables of wood, wax, and ivory; to which may be added plates of lead, linen rolls, &c. At length the Egyptian papyrus was invented; then parchment, then cotton paper, and lastly, the common, or linen paper.

In some places and ages they have even written on the skins of fishes; in others, on the intestines of serpents; and in others, on the backs of tortoises. Mabill. de Re Diplom. lib. i. cap. 8. Fabric. Biblioth. Nat. cap. 21, &c. There are few sorts of plants but have at some time been used for paper and books: and hence the several terms, biblos, codex, liber, folium, tabula, tellura, philura, scheda, &c. which express the several parts on which they were written: and though in Europe all these disappeared upon the introduction of the papyrus and parchment, yet in some other countries the use of divers of them obtains to this day. In Ceylon, for instance, they write on the leaves of the talipot. And the Bramin MSS. in the Tulinga language, sent to Oxford from Fort St. George, are written on leaves of the ampana, or palma Malabarica: Hermannus gives an account of a monstrous palm-tree called coddia panna, or palma montana Malabarica, which about the thirty-fifth year of its age rises to be sixty or seventy feet high, with plicated leaves nearly round, twenty feet broad; wherewith they commonly cover their houses; and on which they also write; part of one leaf sufficing to make a moderate book. They write between the folds, making the characters through the outer cuticle. Knox. Hist. Ceyl. lib. iii. Le Clerc. Bibl. Univ. tom. xxiii. p. 242. Phil. Trans. No. 226. p. 422, seq. Vide Hort. Ind. Malab. p. 3. Phil. Trans. No. 145. p. 108.

In the Maldivée islands, the natives are said to write on the leaves of a tree called macaraquean, which are a fathom and a half long, and about a foot broad. And in divers parts of the East Indies, the leaves of the musa arbor, or plantain-tree, dried in the sun, served for the same use.

Egyptian paper was principally used among the ancients; being made of the papyrus, or biblus, a species of rush, which grew on the banks of the Nile: in making it into paper, they began with lopping off the two extremes of the plant, the head and the root: the remaining part, which was the stem, they cut lengthwise into two nearly equal parts, and from each of these they stripped the scaly pellicles of which it consisted. The innermost of these pellicles were looked on as the best, and that nearest the rind as the worst: they were therefore kept apart, and made to constitute two different sorts of paper. As the pellicles were taken off, they extended them on a table, laying them over each other transversely, so as that the fibres made right angles: in this state they were glued together by the muddy waters of the Nile; or, when those were not to be had, with paste made of the finest wheat flour, mixed with hot water and a sprinkling of vinegar.

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The pellicles were next pressed, to get out the water, then dried, and lastly flattened and smoothed by beating them with a mallet: this was the Egyptian paper, which was sometimes further polished by rubbing it with a glass ball, or the like.

Bark paper was only the inner whitish rind, inclosed between the bark and the wood of several trees, as the maple, plane, beech, and elm, but especially the tilia, or linden-tree, which was that mostly used for this purpose. On this, stripped off, flattened, and dried, the ancients wrote books, several of which are said to be still extant.

Chinese paper is of various kinds; some is made of the rinds or barks of trees, especially the mulberry-tree and elm, but chiefly of the bamboo and cotton-tree. In fact, almost each province has its several paper. The preparations of paper made of the barks of trees may be instanced in that of the bamboo, which is a tree of the cane or reed kind. The second skin of the bark, which is soft and white, is ordinarily made use of for paper: this is beat in fair water to a pulp, which they take up in large moulds, so that some sheets are above twelve feet in length: they are completed by dipping them, sheet by sheet, in alum water, which serves instead of the size among us, and not only hinders the paper from imbibing the ink, but makes it look as if varnished over. This paper is white, soft, and close, without the least roughness, though it cracks more easily than European paper; is very subject to be eaten by the worms, and its thinness makes it liable to be soon worn out.

Cotton paper is a sort of paper which has been in use upwards of six hundred years. In the grand library at Paris are manuscripts on this paper, which appear to be of the tenth century; and from the twelfth century, cotton manuscripts are more frequent than parchment ones. Cotton paper is still made in the East Indies, by beating cotton a rags to pulp.

Linen or European paper appears to have been first introduced among us towards the beginning of the fourteenth century, but by whom this valuable commodity was invented is not known. The method of making paper of linen or hempen rags is as follows.

The first instrument is called the duster, made in the form of a cylinder, four feet in diameter, and five feet in length. It is altogether covered with a wire net, and put in motion by its connexion with some part of the machinery. A convenient quantity of rags before the selection are inclosed in the duster, and the rapidity of its motion separates the dust from them, and forces it through the wire. It is of considerable advantage to use the duster before selection, as it makes that operation less pernicious to the selectors.

The selection is then to be made; and it is found more convenient to have the tables for cutting off the knots and stitching, and for forming them into a proper shape, in the same place with the cutting-table. The surface both of these and of the cutting-table is composed of a wire net, which in every part of the operation allows the remaining dust and refuse of every kind to escape.

The rags, without any kind of putrefaction, are again carried from the cutting-table back to the duster, and from thence to an engine, where, in general, they are in the space of six hours re-

duced to the stuff proper for making paper. The hard and soft of the same quality are placed in different lots; but they can be reduced to stuff at the same time, provided the soft is put somewhat later into the engine.

The engine is that part of the mill which performs the whole action of reducing the rags to paste, or, as it may be termed, of trituration. The number of the engines depends on the extent of the paper-work, on the force of water, or on the construction of the machinery.

When the stuff is brought to perfection, it is conveyed into a general repository, which supplies the vat from which the sheets of paper are formed. This vat is made of wood; and generally about five feet in diameter, and two and a half in depth. It is kept in temperature by means of a grate introduced by a hole, and surrounded on the inside of the vat with a case of copper. For fuel to this grate, charcoal or wood is used; and frequently, to prevent smoke, the wall of the building comes in contact with one part of the vat, and the fire has no communication with the place where they make the paper.

Every vat is furnished on the upper part with planks inclosed inwards, and even railed in with wood, to prevent any of the stuff from running over in the operation. Across the vat is a plank which they call the trepan, pierced with holes at one of the extremities, and resting on the planks which surround the vat.

The forms or moulds are composed of wire cloth, and a moveable frame. It is with these that they fetch up the stuff from the vat, in order to form the sheets of paper. The sides of the form are made of oak, which is previously steeped in water, and otherwise prepared to prevent warping. The wire cloth is made larger than the sheet of paper, and the excess of it on all sides is covered with a moveable frame. This frame is necessary to retain the stuff of which the paper is made on the cloth; and it must be exactly adapted to the form, otherwise the edges of the paper will be ragged and badly finished. The wire cloth of the form is varied in proportion to the fineness of the paper and the nature of the stuff.

The felts are pieces of woollen cloth spread over every sheet of paper, and upon which the sheets are laid to detach them from the former, to prevent them from adhering together, to imbibe part of the water with which the stuff is charged, and to transmit the whole of it when placed under the action of the press. The two sides of the felt are differently raised: that of which the hair is longest is applied to the sheets which are laid down; and any alteration of this disposition would produce a change in the texture of the paper. The stuff of which the felts are made should be sufficiently strong, in order that it may be stretched exactly on the sheets without forming into folds; and, at the same, sufficiently pliant to yield in every direction without injury to the wet paper. As the felts have to resist the reiterated efforts of the press, it appears necessary that the warp be very strong, of combed wool, and well twisted. On the other hand, as they have to imbibe a certain quantity of water, and to return it, it is necessary that the woof be of carded wool, and drawn out into a slack thread. These are the utensils, together with the press, which are used in the apartment where the sheets of paper are formed.

The vat being furnished with a sufficient quan-

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tity of stuff and of water, two instruments are employed to mix them; the one of which is a simple pole, and the other a pole armed with a piece of board, rounded and full of holes. This operation is repeated as often as the stuff falls to the bottom. In the principal writing-mills in England, they use for this purpose what is called a hog; which is a machine within the vat, that, by means of a small wheel on the outside, is made to turn constantly round, and keep the stuff in perpetual motion. When the stuff and water are properly mixed, it is easy to perceive whether the previous operations have been complete. When the stuff floats close, and in regular flakes, it is a proof that it has been well triturated; and the parts of the rags which have escaped the rollers also appear.

After this operation the workman takes one of the forms, furnished with its frame, by the middle of the short sides; and fixing the frame round the wire cloth with his thumbs, he plunges it obliquely four or five inches into the vat, beginning by the long side, which is nearest to him. After the immersion he raises it to a level: by these movements he fetches up on the form a sufficient quantity of stuff; and as soon as the form is raised, the water escapes through the wire cloth, and the superfluity of the stuff over the sides of the frame. The fibrous parts of the stuff arrange themselves regularly on the wire cloth of the form, not only in proportion as the water escapes, but also as the workman favours this effect by gently shaking the form. Afterwards, having placed the form on a piece of board, the workman takes off the frame or deckle, and glides this form towards the coucher; who, having previously laid his felt, places it with his left hand in an inclined situation, on a plank fixed on the edge of the vat, and full of holes. During this operation the workman applies his frame, and begins a second sheet. The coucher seizes this instant, takes with his left hand the form, now sufficiently dry, and, having laid the sheet of paper upon the felt, returns the form by gliding it along the trepan of the vat.

They proceed in this manner, laying alternately a sheet and a felt, till they have made six quires of paper, which is called a post: and this they do with such swiftness, that, in many sorts of paper, two men make upwards of twenty posts in a day. When the last sheet of the post is covered with the last felt, the workmen about the vat unite together, and submit the whole heap to the action of the press. They begin at first to press it with a middling lever, and afterwards with a lever about fifteen feet in length. After this operation, another person separates the sheets of paper from the felts, laying them in a heap; and several of these heaps collected together are again put under the press.

The stuff which forms a sheet of paper is received, as we have already said, on a form made of wire cloth, which is more or less fine in proportion to the stuff, and surrounded with a wooden frame, and supported in the middle by many cross bars of wood. In consequence of this construction, it is easy to perceive, that the sheet of paper will take and preserve the impressions of all the pieces which compose the form, and of the empty spaces between them.

The traces of the wire cloth are evidently perceived on the side of the sheet which was attached to the form, and on the opposite side they form

an assemblage of parallel and rounded risings. As in the paper which is most highly finished the regularity of these impressions is still visible, it is evident that all the operations to which it is submitted have chiefly in view to soften these impressions without destroying them. It is of consequence, therefore, to attend to the combination of labour which operates on these impressions. The coucher, in turning the form on the felt, flattens a little the rounded eminences which are in relief on one of the surfaces, and occasions at the same time the hollow places made by the wire cloth to be partly filled up. Meanwhile, the effort which is made in detaching the form produces an infinite number of small hairs on every protuberant part of the sheet.

Under the action of the press, first with the felts and then without them, the perfecting of the grain paper still goes on. The vestiges of the protuberances made by the wires are altogether flattened, and of consequence the hollows opposite to them disappear also; but the traces formed by the interstices of the wire, in consequence of their thickness, appear on both sides, and are rounded by the press.

The risings traced on each side of the paper, and which can be discovered by the eye on that which is most highly finished, form what is called the grain of paper. The different operations ought to soften, but not destroy it; which is effectually done by employing the hammer. This grain appears in the Dutch paper; which is a sufficient proof that though they have brought this part of the art to the greatest perfection, they have not employed hammers, but more simple and ingenious means. The grain of paper is often disfigured by the felts when they are too much used, or when the wool does not cover the thread. In this case, when the paper is submitted to the press, it takes the additional traces of the warp and the woof, and composes a surface extremely irregular.

The paper the grain of which is highly softened, is much fitter for the purposes of writing than that which is smoothed by the hammer: on the other hand, a coarse and unequal grain very much opposes the movements of the pen; as that which is beat renders them very uncertain. The art of making paper, therefore, should consist in preserving, and at the same time in highly softening, the grain: the Dutch have carried this to the highest perfection.

The exchange succeeds the operation last described. It is conducted in a hall contiguous to the vat, supplied with several presses, and with a long table. The workman arranges on this table the paper, newly fabricated, into heaps; each heap containing eight or ten of those last under the press, kept separate by a woollen felt. The press is large enough to receive two of them at once, placed the one at the other's side. When the compression is judged sufficient, the heaps of paper are carried back to the table, and the whole turned sheet by sheet, in such a manner that the surface of every sheet is exposed to a new one; and in this situation they are again brought under the press. It is in conducting these two operations sometimes to four or five times, or as often as the nature of the paper requires, that the perfection of the Dutch plan consists. If the stuff is fine, or the paper slender, the exchange is less frequently repeated. In this operation it is necessary to alter the situation of the heaps, with regard to one another, every

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time they are put under the press; and also, as the heaps are highest toward the middle, to place small pieces of felt at the extremities, in order to bring every part of them under an equal pressure. A single man with four or five presses may exchange all the paper produced by two vats, provided the previous pressing at the vats is well performed. The work of the exchange generally lasts about two days on a given quantity of paper.

When the paper has undergone these operations, it is not only softened in the surface, but better felted, and rendered more pliant in the interior parts of the stuff. In short, a great part of the water which it had imbibed in the operation of the vat is dissipated. By the felt-ing of paper is understood the approximation of the fibres of the stuff, and their adhering more closely together. The paper is felted in proportion as the water escapes, and this effect is produced by the management and reiterated action of the press. Was it not for the gradual operation of the press, the paper would be porous, and composed of filaments adhering closely together. The superiority of the Dutch over the French paper depends almost entirely on this operation.

If the sheets of paper are found to adhere together, it is a proof that the business of the press has been badly conducted. To avoid this inconvenience, it is necessary to bring down the press at first gently, and by degrees with greater force, and to raise it as suddenly as possible. By this means the water, which is impelled to the sides of the heaps, which has not yet escaped, returns to the centre; the sheets are equally dry, and the operation is executed without difficulty.

According to the state of dryness in which the paper is found when it comes from the apartment of the vat, it is either pressed before or after the first exchange. The operation of the press should be reiterated, and managed with great care; otherwise, in the soft state of the paper there is a danger that its grain and transparency are totally destroyed. Another essential principle to the success of the exchange is, that the grain of the paper is originally well raised. For this purpose the wire cloth of the Dutch forms is composed of a rounder wire than that used in France, by which they gain the greatest degree of transparency, and are in no danger of destroying the grain. Besides this, the Dutch take care to proportion the wires even where the forms are equal to the thickness of the paper.

Almost every kind of paper is considerably improved by the exchange, and receives a degree of perfection which renders it more agreeable in the use. But it is necessary to observe at the same time, that all papers are not equally susceptible of this melioration; on the contrary, if the stuff is unequal, dry or weakened by the destruction of the fine parts, it acquires nothing of that lustre and softness, and appearance of velvet, which the exchange gives to stuff properly prepared.

The sheds for drying the paper are in the neighbourhood of the paper-mill, and are furnished with a vast number of cords, on which they hang the sheets both before and after the sizing. The sheds are surrounded with moveable lattices, to admit a quantity of air sufficient for drying the paper. The cords of the shed are stretched as much as possible; and the paper, four or five sheets of it together, is placed on them by means of a wooden instrument resembling a pick-axe.

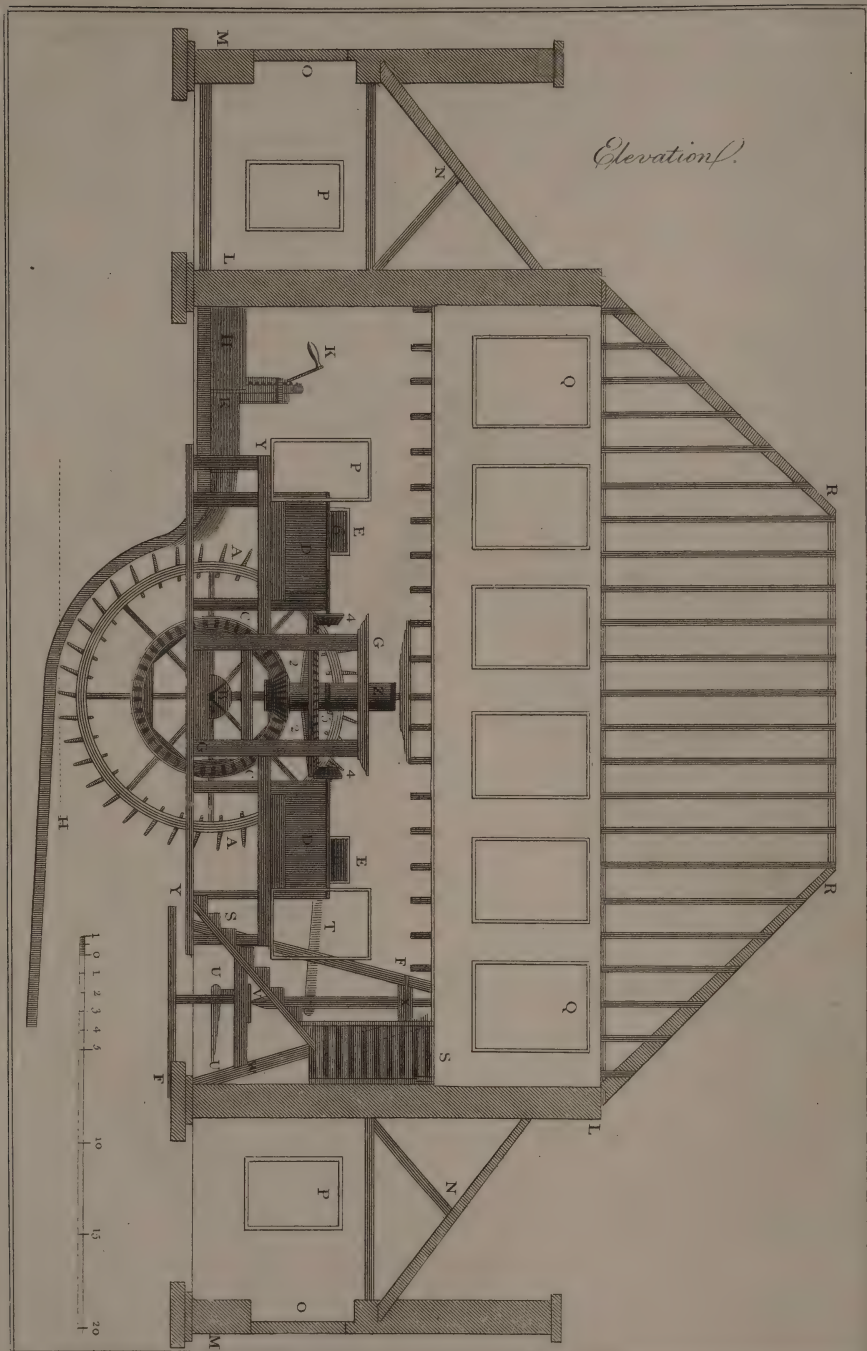
The principal difficulty in drying the paper consists in gradually admitting the external air, and in preventing the cords from imbibing moisture. With regard to the first of these, the Dutch use very low sheds, and construct their lattices with great exactness. By this means the Dutch paper is dried equally, and is extremely supple before the sizing. They prevent the cords from imbibing the water by covering them with wax. In using such cords, the moisture does not continue in the line of contact between the paper and the cord, which prevents the sheet from stretching in that particular place by its weight, and from the folds which the moisture in the subsequent operations might occasion. The Dutch also employ cords of considerable thickness, and place fewer of them under the sheets; by which means they diminish the points of contact, and give a freer and more equal circulation to the air.

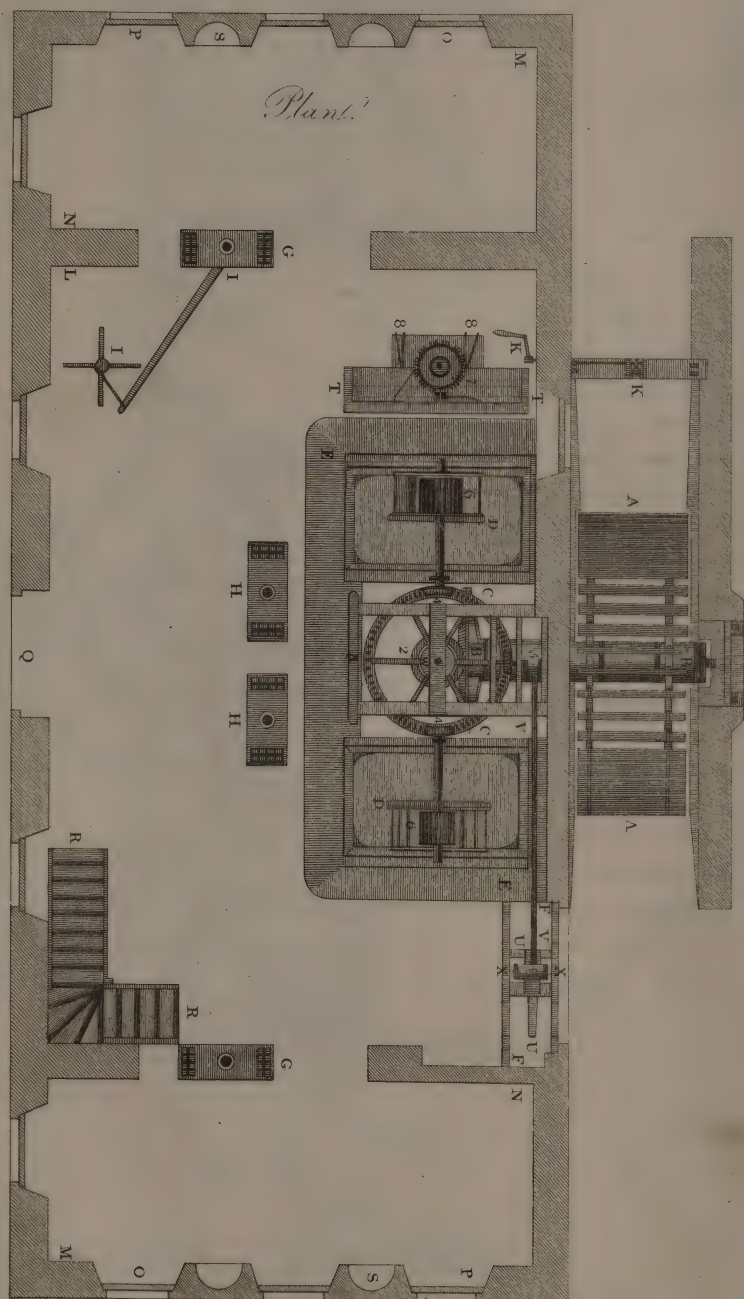
The size for paper is made of the shreds and parings got from tanners, curriers, and parchment-makers. All the putrefied parts and the lime are carefully separated from them, and they are inclosed in a kind of basket, and let down by a rope and pulley into the cauldron. This is a late invention, and serves two valuable purposes. It makes it easy to draw out the pieces of leather when the size is extracted from them by boiling, or easy to return them into the boiler if the operation is not complete. When the substance is sufficiently extracted it is allowed to settle for some time; and it is twice filtered before it is put into the vessel into which they dip the paper.

Immediately before the operation a certain quantity of alum is added to the size. The workman takes a handful of the sheets, smoothed and rendered as supple as possible, in his left hand, dips them into the vessel, and holds them separate with his right, that they may equally imbibe the size. After holding them above the vessel for a space of time, he seizes on the other side with his right hand, and again dips them into the vessel. When he has finished ten or a dozen of these handfuls, they are submitted to the action of the press. The superfluous size is carried back to the vessel by means of a small pipe. The vessel in which the paper is sized is made of copper, and furnished with a grate, to give the size when necessary a due temperature: and a piece of thin board or felt is placed between every handful as they are laid on the table of the press.

The Dutch are very careful in sizing their paper, to have every sheet in the same handful of equal dryness; because it is found that the dry sheets imbibe the size more slowly than those which retain some degree of moisture. They begin by selecting the padges in the drying-house; and after having made them supple, and having destroyed the adherence between the sheets, they separate them into handfuls in proportion to the dryness, each of them containing that number which they can dip at one time. Besides this precaution, they take care to apply two sheets of brown paper of an equal size to every handful. This brown paper, firm, solid, and already sized, is of use to support the sheets.

As soon as the paper is sized, it is the practice at some paper-mills to carry it immediately to the drying-house, and hang it before it cools, sheet by sheet, on the cords. The paper, unless particular attention is paid to the lattices of the drying-house, is apt to dry too fast, whereby a great part of the size goes off in evaporation; or, if too slow, it falls to the ground. The Dutch drying-houses are





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the best to prevent these inconveniences: but the exchange after the sizing, which is generally practised in Holland, is the best remedy. They begin this operation on the handfuls of paper, either while they are still hot, or otherwise as they find it convenient. But, after the exchange, they are careful to allow the heaps to be altogether cold before they are submitted to the press. Without this precaution the size would either be wholly squeezed out by the press of the exchange, or the surface of the paper become very irregular. It is of consequence that the paper, still warm from the sizing, grows gradually firm, under the operation of the exchange, in proportion as it cools. By this method it receives that varnish which is afterwards brought to perfection under the press, and in which the excellence of the paper either for writing or drawing chiefly consists. It is in consequence of the exchanging and pressing that the Dutch paper is soft and equal; and that the size penetrates into the body of it, and is extended equally over its surface.

The exchange after the sizing ought to be conducted with the greatest skill and attention, because the grain of the paper then receives impressions which can never be eradicated. When the sized paper is also exchanged, it is possible to hang more sheets together on the cords of the drying house. The paper dries better in this condition, and the size is preserved without any sensible waste, because the sheets of paper mutually prevent the rapid operation of the external air. And as the size has already penetrated into the paper, and is fixed on the surface, the insensible progress of a well-conducted drying-house renders all the good effects more perfect in proportion as it is slowly dried.

If to these considerations is added the damage done to the paper in drying it immediately after the press of the sizing-room, whether it is done in raising the hairs by separating the sheets, or in cracking the surface, it is evident that the trouble of the second exchange is infinitely overpaid by the advantage.

When the paper is sufficiently dry, it is carried to the finishing-room, where it is pressed, selected, examined, folded, made up into quires, and finally into reams. It is here put twice under the press; first, when it is at its full size, and secondly, after it is folded.

The principal labour of this place consists in assorting the paper into different lots, according to its quality and faults; after which it is made up into quires. The person who does this must possess great skill, and be capable of attention, because he acts as a check on those who separated the paper into different lots. He takes the sheets with his right hand, folds them, examines them, lays them over his left arm till he has the number requisite for a quire, brings the sides parallel to one another, and places them in heaps under the table. An expert workman, if proper care has been taken in assorting the lots, will finish in this manner near 6000 quires in a day.

The paper is afterwards collected into reams of 20 quires each, and for the last time put under the press, where it is continued for 10 or 12 hours, or as long as the demand of the paper-mill permits. We shall now explain the structure of one of the best paper-mills now in use.

The plan is exhibited in plate 130, where AA is the water wheel fixed upon its shaft or axle BB; on which axle is also fastened the wheel CC, containing 78 teeth or cogs, to turn the wheel No. 2.

having 27 teeth, which is placed upon the lower end of the axle W. Upon the same axle is fixed the wheel No. 3. containing 72 teeth, to drive the two pinions No. 4. and 4. each of them having 14 teeth, which are fastened upon the iron axles or spindles, on which axles are likewise fixed the cutting or beating rollers No. 6. and 6. DD, are the engine troughs or boxes in which the beating rollers revolve. EE, a platform round the engines. TT, an elevation of the engine troughs. No. 7. the beating roller, round the circumference of which are fixed plates of steel that cut or beat the rags, by passing over several steel plates screwed together, and fixed in the bottom of the trough with their edges facing the roller. No. 8. and 8. the blinds, or slip-boards and washers. FF is the frame of the glazing machine. XX, the axle and pivots on which the glazing pole is suspended; the pole being moved by the rod VV, one end of which goes upon a bend or crank in the iron spindle that carries the pinion No. 5. having 15 teeth, which is turned by the wheel No. 3. UU, a lever for raising the glazing plate to the pole, or depressing it at pleasure. GG and HH, are the screw presses. II, the windlass and lever for setting the press. NN, the mill-house; and MM, the vat-houses adjoining to it. RR, a stair leading to the lofts. SS, furnaces or fire-places in the wall. Q, a door in the side wall of the mill-house. OP, windows to light the mill-house.

Elevation.—Plate 131. AA, the great wheel, containing 40 float-boards or awls, upon which the water impinges to drive the wheel. B, The shaft or axle of the great wheel. On this axle is also fixed the wheel CC, in which are 78 teeth or cogs, to turn the wheel No. 2. having 27 teeth, which is fastened upon the perpendicular axle ZZ; on which shaft is likewise placed the wheel No. 3. containing 72 teeth, to turn the pinions No. 4. and 4. having each 14 teeth, which are fixed upon the iron axles or spindles, on which spindles are fastened the cutting or beating rollers No. 6. and 6. DD, the engine troughs in which the beating rollers revolve. EE, are covers that inclose the rollers. GG, the frame that carries the axles with the wheels. FF the frame of the glazing engine. XT, the glazing pole suspended on its gudgeon at X, and moved by the horizontal rod T, from a crank or bend in an iron spindle that carries a pinion at No. 5. driven by the wheel No. 3. (which is seen in the plan in No. 1.) V, the glazing plate, made of cast iron, fixed upon a bearer that moves on an iron bolt in the frame at W; and the plate V is raised up at pleasure to the glazing pole XT, by pressing down the longer arm of the lever UU, which moves on an iron bolt in the frame. The gudgeons of axles and rounds of spindles should all turn in bushes of brass. HH, fall or course of the water. KK, the machine and handle that raise the sluice to let the water on the great wheel to turn it round. YY, are frames that support the engines and platforms round them. LL, walls of the mill-house. RR, the couples or frame of the roof. MM, the walls of the vat-houses. NN, their roofs. OP, windows to light the lower part of the house. SS. a stair going up to the lofts. QQ, windows in the upper part of the mill-house, commonly made use of for drying the paper. This description of a paper-mill we have extracted from Gray's Millwright.

In April, 1805, Mr. Joseph Bramah took out a patent for sundry improvements in the art of making paper. These improvements are directed to

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four distinct objects in the process of making paper. 1. To perform the office of moulder of the sheets by machinery. 2. To a contrivance for making paper of "endless" sheets. 3. To obviate the necessity of employing many presses for dry work. 4. To render the raising and taking down the ponderous frames on which the paper is hung in the drying-house unnecessary.

From the attainment of the first object it results that the moulding of the sheets may be conducted by persons not possessing the usual skill of those employed in the paper manufactory; and by such application of machinery, sheets of much larger than usual dimensions can easily be made pretty uniform in their weight and thickness. To accomplish this, the dimensions of the vat, called the regulating reservoir, in which the stuff for moulding is usually put, are to be in length and width, exactly the same as those of the proposed sheet, and about 20 inches deep; this vat contains a frame or rim of wood, which is made to slide up and down at pleasure, and, in such manner that the frame may be raised or depressed by a handle or winch applied externally. The paper mould is also carefully fitted on all sides to the interior of the reservoir, and is rested upon the sliding rim so as to be lifted up or lowered, still retaining an horizontal position when the frame is moved down or up for that purpose; the mould and frame moving always uniformly together. On the side or end of this reservoir near the bottom, is cut a tolerably large aperture, through which the water that filled the reservoir can quickly discharge itself. This aperture communicates with a hollow trunk; and there is another cistern, viz. the feeder or stuff-cistern, which has an agitator to prevent the unequal mixing of the pulp and water; but the minuter details of the various parts cannot well be given here.

When the whole is ready for action the regulating reservoir is filled with water till it discharges at the mouth of the external trunk; and then the mould, being at the lowest station, has the wire surface immersed more than a quarter of an inch below the surface of the water; and the valve or lid which covers the mouth of the trunk being then shut, prevents the escape of the water from the interior of the reservoir. While the machine is in this situation, the sluice which opens the communication between the feeder above the mould is lifted up, and admits the stuff from the feeding cistern to flow upon the surface of the mould to any limited gauge allowed for the sheet: when this quantity has flowed, the sluice is quickly shut; and then, by the motion of the apparatus, which lifts and lowers the frame and mould, it is raised with more or less slowness, as experience may suggest, up to its greatest altitude. By opening the valve of the waste trunk at the instant the mould begins to rise, all the water is immediately discharged from above the mould by passing through the wire into the lower part, and is carried off to the former level of the waste, being thus prepared for the depression of another mould: for the loaded one, when raised to its highest station, is made to push away on slides to meet the coucher's hand, who at the same time furnishes the alternate mould; and when the mould is again depressed, the waste valve being shut, the machine is fitted for a second charge; and thus the process is continued with ease and certainty.

By the second improvement paper is made in sheets of any length and width whatever, by a cir-

culating process performed with a wheel or circular frame, composed of rings of thin wood or metal, of three feet or more in diameter, and of a width suitable to the size of paper intended to be made. This wheel is mounted on a horizontal axis, and has a shield on each side the upper extremity of its periphery, made to fit the edges of the extreme rings, in a segment form nearly watertight, so as to prevent the lateral discharge of fluid passing over the wheel. These rings are kept at their stationary distance by transverse thin bars or ribs similar to those used to strengthen a common paper mould; and when this is done, all the face of this wheel is covered or worked with wire so as to form a complete circular mould. This mould or wheel being placed so as to be capable of being turned by hand or otherwise, a feeding cistern, prepared with stuff (as before), is stationed above the wheel; and by means of a sluice or regulator, this stuff may be let upon the wheel in any required quantity, as that wheel is turning on its axis. Thus, while the water is uniformly carried off by falling through the wire, the pulp is left upon the wheel, as in the instance of the common mould, and a constant and endless process may be kept up to any extent. This Mr. Bramah calls an universal revolving paper mould, in addition to which he fixes a little above or below the horizontal plane passing through the centre of the wheel, and opposite to the feeding point, a roller covered with felt; such roller being fixed in contact with the wheel by means of two springs upon the axis of the former, which regulates and renders uniform and gentle the contact of their peripheries as they are turning each other round,—for it signifies not to which of the axes the mover is applied. This is called the couching roller, since it takes the paper from the mould as they mutually turn. Two other rollers are also covered with felt, or woollen cloth, and placed in firmer contact with each other, and between them the sheet is conducted from the couching roller. These are called squeezing rollers; and after the paper has passed through them it may be passed successively between others, and thus made as dry as possible. The paper is then to be conducted over heated plates, charcoal, or other fires, or passed between the rollers of heated calenders; so that when it leaves the machine it may be fit for use.

By the third improvement the necessity of employing many presses for the dry work is obviated. Mr. Bramah constructs a press on what he calls his patent hydro-mechanical principle, of sufficient power, capacity, and strength, to receive the largest sheets proposed to be made; and also competent to withstand the greatest exertion the preparation of each class of paper may require from the press. This press is to be stationed about the middle of the room where the dry-press work in a paper-mill is carried on: and a rail-road of wood or metal, similar to the rail-roads used in larger works, is extended in a straight line to some distance on each side of the press; so that, by means of this, carriages or planks, moving on small wheels or casters, may be wheeled into the press on one side, and pressed through it to the opposite, when the process of pressing is completed. Instead of more presses, Mr. Bramah proposes to use a considerable number of another kind of apparatus called retainers, which consist of a top and bottom bed of wood or metal, of sufficient strength to resist the re-action of the paper when the press is slackened from its severest squeeze, and to retain it in its

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most compressed state for any required length of time, after the grasp of the press has been finally withdrawn: in these retainers vertical bars are fixed at the corners of the lower bed, slide through slits in the upper one, and have each several holes to receive wedges or keys; by which the upper bed of the retainer is made to preserve the state into which it has been pressed, notwithstanding any efforts of the paper and felts to expand to the space they originally occupied. The process of moving these retainers under the press, fixing the upper bed, and then removing the retainer, by means of the rail-road, may be easily understood without dwelling upon particulars. It may just be observed, however, that the head of the press is made so much narrower as to admit the four bars which compose the sides or jambs of each retainer to pass it on each side during the upward motion of the press (for it must be recollected that in Mr. Bramah's press the lower part is compelled to move upward) as the paper is compressed; or, in some cases, four holes are made through the head, or upper bed of the press itself.

By the fourth improvement, which saves the manual labour of raising up and taking down the cumbersome frames on which the paper is hung, much facility is given to the process of hanging and re-hanging the sheets exposed to be dried. The contrivance consists simply in having a proper number of frames something similar to laundress's clothes-horses, stationed at suitable distances from each other by means of upright posts, with grooves fitted to the frames, so that each may be slid vertically up and down by means of lines and pulleys attached to each, just like sash-windows double hung; so that while one of the frames is slid up to touch the ceiling of the building with its upper edge, the one connected with it may be depressed till its lower edge, or the paper which hangs upon it, may come nearly in contact with the floor. Thus the paper may easily be hung on the frames while they are down within reach, and then they may be elevated to any convenient altitude for drying.

The well-known and established ingenuity of Mr. Bramah, as a mechanical inventor, will always ensure a candid and respectful attention to whatever improvements he may suggest: and in the case of the present specification some material advantage will doubtless result from the adoption of his proposed contrivances. Of these, that described under the second head will be found of much utility in the manufacture of paper for large maps and for the hanging of rooms: but we apprehend that in actual practice some difficulties will arise (which may not yet have occurred to the mind of the inventor), from the effect of contrary forces during the motion of the wheel: with too rapid a motion the centrifugal force would cause the particles upon the wheel to be scattered, which are to constitute the paper; while with too slow a motion the effect of the gravitating force would cause several of them to fall off. Perhaps, however, Mr. B. may advert to these points when he speaks of the "speed which nothing but practice and attention to necessary circumstances can determine."

It ought also to be remarked that Mr. B.'s method of drying by heated plates, charcoal fires, &c. cannot be universally applicable: in many kinds of paper where the beauty consists in softening the grain without destroying it, this method could not, we believe, be adopted at all. Under the action of the press in the common way, first with the

felts, and then without them, the perfecting of the grain of the paper still proceeds; and the business of the exchange, as the workmen term it, completes the process: but in all this some days are generally employed; and we fancy the nature of the paper would undergo a great and depreciating change, if the sheets were attempted to be brought to the same state of dryness, in a few hours or minutes.

Other patents for nearly like purposes have been taken out by Messrs. Fourdrinier; for descriptions of which see Retrospect of Discoveries, No. 9 and 15.

In a late volume of the *Annales de Chimie* we meet with some useful hints relative to the manner of re-manufacturing the paper of old books, or any letters or other paper already used for writing or printing, by MM. Deyeux, Pelletier, Molard, and Verkaven.

I. Process for re-fabricating printed paper:—All paper of the same quality should be collected, and separated from such as may have any writing on the pages; the edges of those leaves which may have become yellow, and also the backs of books, being cut off by the instrument used by bookbinders. One hundred weight of paper is now to be put, sheet by sheet, into vats, sufficiently capacious to contain it, together with 500 quarts of hot water, but which ought to be filled about one-third: the whole is next stirred by two men for the space of one hour, who are gradually to add as much water as will rise about three inches above the paper; after which it is left to macerate four or five hours; the agitation being occasionally repeated, so as to separate, and at length to form the paper into a kind of paste.

The water is now drawn off by means of pipes, and the pulp conveyed to the mill, where it is to be coarsely ground for one hour; at the expiration of which it is boiled in a cauldron for a similar space, with a sufficient quantity of water to rise four or five inches above it. A short time before the mixture begins to boil, thirteen quarts of caustic ley of potash are to be added to every cwt. of paper. The ley alluded to is prepared by dissolving 100lbs. of potash in 300 quarts of boiling water, to which are to be added 20lbs. of pulverized quick-lime; and the whole must be briskly agitated, till it become of an uniform consistence, when it is suffered to stand for 12 hours; at the end of this time it must be drawn off, and 75 quarts of boiling water added to the sediment, which being stirred for half an hour, and suffered to stand till it become clear, is to be mixed with the liquor first decanted.

When the paste has boiled in this ley for one hour, the fire is to be extinguished, and the matter suffered to macerate for 12 hours; after which it must be taken out, drained, put into bags, and submitted to the action of a strong press for a similar length of time, to deprive it of all moisture; and, if it appear white, so that the printer's ink be properly extracted, it may be re-manufactured in the usual manner.

II. Process for the re-fabrication of written paper:—The paper must be sorted; the yellow edges cut off; and the whole thrown, leaf by leaf, into a tub half full of boiling water, where it is to be agitated as before directed. After it has macerated four hours, the water should be drawn off; a fresh quantity of boiling water added; and the mixture stirred for half an hour: at the expiration of which the paper is again left to dissolve for three hours.

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The fluid is now drawn off, and 260 quarts of cold water poured on each cwt. of paper; which being perfectly mixed, 6lbs. of oil of vitriol are to be gradually added; and the whole strongly agitated for a considerable time, that the paper may thoroughly imbibe the liquor.

This composition is next suffered to macerate for twelve hours; the agitation being occasionally repeated, when the tub is to be filled up with cold water; and the mixture again stirred, to wash the paper, which will now be reduced to a perfect paste. Lastly, after drawing off the water, the pulp must be put into bags, pressed, and ground in a mill; after which it is conveyed to the vat, and worked in the manner practised with linen rags.

In the year 1801 a patent was granted to Mr. Koops, for extracting ink from printed paper, and restoring it to its original state. His process varies little from that above described; the paper being agitated in hot water to extract the size, and reduce it into a pulp: next, the adhesion of the ink is to be removed by a caustic alkali prepared of lime and potash, the quantities of which should be proportioned to those of the paper. After discharging the ink, he directs the pulp to be bleached by means of the oxygenated marine acid, in the proportion of 10 or 12 gallons to 140lbs. of the material; and, when sufficiently whitened, it is re-manufactured in the usual manner. According to the patentee's account, writing paper does not require so large a proportion, if any, of the caustic alkali; but is bleached by confining it in a wooden box, rendered air tight; into which the acid gas is thrown directly from the retort wherein it was produced.

The staining or dyeing of paper is performed by applying, with soft brushes, any of the colours used for tinging other substances, after tempering them properly with size or gum-water. Should the paper not be sufficiently hard to receive the tint without sinking, it will first be necessary to size it, or to employ a larger proportion of gum with the tinging matters. And if the paper is to be of a uniform colour, the latter must be fixed by several thin coatings, each being suffered to dry before another is applied; as the shade will otherwise appear unequal.

As writing paper is often imperfectly sized, in consequence of which the ink is apt to sink, it has been recommended to dissolve a small piece of Roman alum in a glass of pure water. This liquor should be gently spread over the suspected part, with a soft sponge; and, after becoming dry, it may be safely used for writing. Should there be any occasion to write on a printed book, or on paper that is too fresh and moist, it will only be necessary to mix a little gum with the ink. Lastly, in case any book or manuscript be stained with oil, or grease, it has been directed to calcine and pulverize the bones of sheep's trotters; and to apply a small portion of the powder to each side of the stain, which should be placed between two sheets of white paper, and the whole submitted for the space of twelve hours to the action of a press: if the stains do not disappear, the process should be repeated in a warm place.

PAPERHANGINGS (Painting of). There are three methods of effecting this. The first by printing on the colours; the second by using the stencil; and the third by laying them on with a pencil, as in other kinds of painting. When the colours are laid on by printing, the impression is made by wooden prints, which are cut in such a manner that the figure to be expressed is made to project

from the surface by cutting away all the other part; and this, being charged with the colours tempered with their proper vehicle, by letting it gently down on the block on which the colour is previously spread, conveys it from thence to the ground of the paper, on which it is made to fall more forcibly by means of its weight, and the effort of the arm of the person who uses the print. It is easy to conclude that there must be as many separate prints as there are colours to be printed. But where there are more than one, great care must be taken, after the first, to let the print fall exactly in the same part of the paper as that which went before; otherwise the figure of the design would be brought into irregularity and confusion. In common paper of low price, it is usual, therefore, to print only the outlines, and lay on the rest of the colours by stencilling, which both saves the expense of cutting more prints, and can be practised by common workmen, not requiring the great care and dexterity necessary to the using several prints. The manner of stencilling the colours is this: the figure, which all the parts of any particular colour make in the design to be painted, is to be cut out in a piece of thin leather or oil-cloth, which pieces of leather, or oil-cloth, are called stencils; and being laid flat on the sheets of paper to be printed, spread on a table or floor, are to be rubbed over with the colour, properly tempered by means of a large brush. The colour passing over the whole is consequently spread on those parts of the paper where the cloth or leather is cut away, and give the same effect as if laid on by a print. This is nevertheless only practicable in parts where there are only detached masses or spots of colours; for where there are small continued lines, or parts that run one into another, it is difficult to preserve the connection or continuity of the parts of the cloth, or to keep the smaller corners close down to the paper; and therefore, in such cases, prints are preferable. Stencilling is indeed a cheaper method of ridding coarse work than printing; but without such extraordinary attention and trouble as render it equally difficult with printing, it is far less beautiful and exact in the effect. For the outline of the spots of colour want that sharpness and regularity that are given by prints, besides the frequent extra lineations, or deviations from the just figure, which happens by the original misplacing of the stencils, or the shifting the place of them during the operation. Pencilling is only used in the case of nicer work, such as the better imitations of the India paper. It is performed in the same manner as other paintings in water or varnish. It is sometimes used only to fill the outlines already formed by printing, where the price of the colour, or the exactness of the manner in which it is required to be laid on, render the stencilling or printing it less proper; at other times it is used for forming or delineating some parts of the design, where a spirit of freedom and variety, not to be had in printed outlines, are desired to be had in the work. The paper designed for receiving the flock is first prepared with a varnish-ground with some proper colour, or by that of the paper itself. It is frequently practised to print some Mosaic, or other small running figure in colours, on the ground, before the flock be laid on; and it may be done with any pigment of the colour desired, tempered with varnish, and laid on by a print cut correspondently to that end. The method of laying on the flock is this: a wooden print being cut, as is above described, for laying on the colour in such

manner that the part of the design which is intended for the flock may project beyond the rest of the surface, the varnish is put on a block covered with leather or oil-cloth, and the print is to be used also in the same manner, to lay the varnish on all the parts where the flock is to be fixed. The sheet, thus prepared by the varnished impression, is then to be removed to another block or table, and to be strewn over with flock, which is afterwards to be gently compressed by a board, or some other flat body, to make the varnish take the better hold of it: and then the sheet is to be hung on a frame till the varnish be perfectly dry, at which time the superfluous part of flock is to be brushed off by a soft camel's-hair brush, and the proper flock will be found to adhere in a very strong manner. The method of preparing the flock is, by cutting woollen rags or pieces of cloth with the hand, by means of a large bill or chopping-knife; or by means of a machine worked by a horse-mill. There is a kind of counterfeit flock-paper, which, when well managed, has very much the same effect to the eye as the real, though done with less expense. The manner of making this sort is, by laying a ground of varnish on the paper, and, having afterwards printed the design of the flock in varnish, in the same manner as for the true; instead of the flock, some pigment, or dry colour, of the same hue with the flock required by the design, but somewhat of a darker shade, being well powdered, is strewn on the printed varnish, and produces nearly the same appearance.

Mr. John Middleton lately communicated some improvements in the printing of paper-hangings to the Society of Arts. They are intended to facilitate the conveyance of the paper over the printing-table, and to give a greater pressure than usual to the block, when printing dark grounds.

To facilitate the conveyance of the paper, two cords 36 feet long are stretched from the printers table to the other end of the room through rings, where they are kept tight by a weight appended to their extremities. The paper to be printed is rolled up on a wooden roller at one side of the table, and its ends brought across the table and fastened between two flat ledges that are connected at one end by an hinge, and at the other by a sliding ring; these ledges slide along the two cords on pulleys placed at each end of them, and serve to draw forward the paper as it is printed; from the middle of these ledges a cord proceeds to the end of the room, between the other two cords where it passes over a pulley, and thence returns to a roller under the table; the circle of this roller extends beyond the table, and there has a wheel fastened to it, from which projects three pins, each about four inches long, by pressing on which with the foot, the wheel is turned round, and with it the roller; by means of which the paper is drawn forward on the cords a space corresponding to the distance between the pins in the wheel.

The contrivance for giving an extraordinary pressure to the block, consists of a long and a short lever projecting from one side of an axle placed over head above the printers table, which levers and the matters supported by them are balanced by a weight appended to an arm which proceeds from the other side of the axle; from the long lever a cord falls to the ground where a treadle is attached to it: a long pole is jointed to the end of the short lever, and descends from it directly over the place of the block, on which it is made to press by standing on the treadle whenever it is

thought proper, and is put out of the way when not wanted, by placing the end of it behind a piece of wood which projects upwards from the back of the table for that purpose.

PAPER. a. Any thing slight or thin (*Burnet*).

To PAPER. v. a. (from the noun.) To register (*Shakspeare*).

PAPERMAKER. s. (*paper and make*.) One who makes paper.

PAPERMILL. s. (*paper and mill*.) A mill in which rags are ground for paper (*Shaks.*).

PAPER-MONEY, bank-bills.

PAPER-OFFICE, an office in the palace of Whitehall, in which all the public writings, matters of state and council, proclamations, letters, intelligences, negotiations abroad, and generally all dispatches that pass through the offices of the secretaries of state, are lodged by way of library.

PAPE'SCENT. a. Containing pap; inclinal to pap (*Arbutnot*).

PAPHIA, a surname of Venus, because the goddess was worshipped at Paphos, in the island of Cyprus.

PAPHLAGONIA, a country of Asia Minor, situate at the west of the river Halys, by which it was separated from the Cappadocians. It was divided on the west from the Bithynians by the river Parthenius.

PAPHOS, a famous city of the island of Cyprus. The goddess of beauty was particularly worshipped there, and her altars, though 100 in number, daily smoked with Arabian frankincense. The inhabitants were very lascivious, and the young virgins were permitted by the laws of the place to get a dowry by prostitution.

PAPIAS, bishop of Hierapolis, a city of Phrygia, in Asia Minor, was, according to Irenæus, the disciple of St. John the Evangelist. He introduced the doctrine of the Millennium, or the temporal reign of Christ on the earth for 1000 years.

PAPIER MACHÉ, is a substance made of cuttings of white or brown paper, boiled in water, and beaten in a mortar till they are reduced into a kind of paste, and then boiled with a solution of gum-arabic or of size, to give tenacity to the paste, which is afterwards formed into different toys, &c. by pressing it into oiled moulds. When dry, it is done over with a mixture of size and lamp-black, and afterwards varnished. The black varnish for these toys, according to Dr. Lewis, is prepared as follows. Some colophony, or turpentine, boiled down till it becomes black and friable, is melted in a glazed earthen vessel, and thrice as much amber in fine powder sprinkled in by degrees, with the addition of a little spirit or oil of turpentine now and then: when the amber is melted, sprinkle in the same quantity of sarcocolla, continuing to stir them, and to add more spirit of turpentine, till the whole becomes fluid; then strain out the clear through a coarse hair bag, pressing it gently between hot boards. This varnish, mixed with ivory-black in fine powder, is applied in a hot room

PAPILIO.

on the dried paper paste, which is then set in a gently heated oven, next day in a hotter oven, and the third day in a very hot one, and let stand each time till the oven grows cold.

PAPILIO. Butterfly. In zoology, a genus of the class insecta, order lepidoptera. Antennas growing thicker towards the tip and generally ending in a knob; wings, when sitting, erect, the edges meeting together over the abdomen: flies in the day-time. Very nearly twelve hundred species scattered over the globe; of which nearly seventy are natives of our own country.

This genus is so extremely voluminous, that it has been judged necessary by every entomologist to divide it into sections and subsections. Fabricius has, upon this subject, been not only more minute, but more fortunate than Linnæus. We shall therefore copy the arrangement of both.

LINNEAN DIVISION.

- A. Equites. Upper wings longer from the posterior angle to the tip than to the base; antennæ often filiform.
 - a. Trojans. Generally black; with sanguineous spots on the breast.
 - ♂. Greeks. Breast without sanguineous spots; an ocellate spot at the angle of the tail.
 - † Wings without bands.
 - †† Wings with bands.
- B. Heleconii. Wings narrow, entire, often naked or semitransparent; the upper ones oblong, the lower ones very short.
- C. Danai. Wings very entire.
- a. Candidi. Whitish wings.
- ♂. Festivi. Variegated wings.
- D. Nymphales. Wings denticulate.
- a. Gemmati. Wings with ocellate spots.
 - † On all the wings.
 - †† On the upper wings only.
 - ††† On the lower wings only.
- ♂. Phalerati. Wings without ocellate spots.
- E. Plebeji. Small: the larvæ often contracted.
 - a. Rurales. Wings with obscure spots.
 - ♂. Urbicolæ. Wings mostly with transparent spots.

FABRICIAN DIVISION.

- I. Papilio. Feelers reflected; tongue exerted, spiral; antennæ thicker towards the tip.
 - A. Upper wings longer from the posterior angle to the tip than to the base.
 - a. Equites. Lower wings cut to admit a free motion of the abdomen.
 - † Trojans. Generally black, with sanguineous spots on the breast.
 - †† Greeks. Breast without sanguineous spots; an ocellate spot at the angle of the tail.
 - ♂. Satyri. Lower wings dilated on the inner margin into a groove for the reception of the abdomen.
 - B. Heleconii. Wings oblong, the lower ones short and rounded.

- C. Parnassii. Wings rounded, entirely, or partially naked.
- D. Wings rounded.
 - a. Festivi. Lower wings distant at the inner edge.
 - ♂. Danai. Lower wings meeting at the inner edge and covering the base of the abdomen.
 - y. Nymphales. Lower wings forming a groove for the reception of the abdomen.
- II. Hesperia. Feelers compressed and hairy at the base, the tip cylindrical and naked; club of the antennæ oblong and often hooked.
 - a. Rurales. Wings with obscure spots.
 - ♂. Urbicolæ. Wings with mostly transparent spots.

These insects feed on the nectar of flowers, and the moisture exuding from trees; the larvæ are active, and furnished with tentacles and sixteen feet; they are sometimes spinous and sometimes naked, and feed voraciously on the leaves of various plants; the pupæ is naked, quiescent, and attached to trees or other substances by filaments either from the tip or the middle.

There is no tribe of insects that has been more accurately examined, or whose history has been so fully detailed. Reaumur and Fabricius are the naturalists to whom we are chiefly indebted for our knowledge of its extensive numbers, and very curious powers.

Some of the species frequently cast their skin, besides undergoing those more considerable transformations which introduce them into a new sphere of action. Before the fresh tunic is developed, the outer skin is seen to wither and lose the vivacity of its colours, owing to the new coat which already covers the animal beneath, and intercepts the juices which formerly circulated through it: after some efforts this dried covering is rent towards the back part of the head, where the fresh skin appears; and through this aperture the worm makes his escape, leaving his spoils behind.

After undergoing several changes of this kind, the insect prepares to undergo another and still more considerable, which is to introduce it into the state of a chrysalid, deprived of almost all motion, and incapable of taking food. This change is effected nearly in the same manner as the foregoing; but in some it is very long in being accomplished. Several species of the butterfly worm construct in a very ingenious manner a coque, or cocoon, or nut of silk, into which they enter before their transformation, and in which they continue for nine months, without food, before their metamorphoses be accomplished. During this long period they are apparently inanimate, and take no nutriment.

Various substances enter into the composition of the habitations constructed by these animals before their metamorphoses: some are of silk; in some, silk is combined with other matters; several kinds construct no habitation, but are protected by a crustaceous shell, formed by a glutinous substance, exuding from their

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bodies: some are suspended vertically, while others hang horizontally by a thread which surrounds the middle of the body.

The external form of the chrysalids varies according to the species of butterfly that inhabits them; in all, however, there are apertures opposite to the thorax, by which respiration is carried on during the whole period of their inactive state. After the appointed time, when the animal has acquired sufficient vigour, the shell is broken, which at once constituted the grave of the caterpillar and the cradle of the butterfly: the down already grown upon the insect has completely separated it on all sides from the shell, which by the action of the head is broken opposite to that part, and affords free egress to the prisoner it so long confined.

The wings of the butterfly, on its first appearance, are closely folded; but by the help of a liquor constantly circulating through them they are soon expanded, and sufficiently hardened, by the action of the air, to endure the efforts of flying. It is then that the insect enters upon a more enlarged sphere of action, with increased powers: he ranges from flower to flower, darting his rostrum into their nectaries for the delicious stores they contain. Then too in the full possession of every faculty granted to his race, he prepares to multiply and perpetuate it.

This last and most considerable metamorphosis is attended with a greater change in the economy of the animal than any of the preceding; for not only the skin, but the teeth, jaws, and even the cranium, are left behind. The large artery which passes along the body may be considered as a succession of different hearts employed in circulating the blood, which is at that important æra observed to flow in a different direction from what it did before, like the fetus of a quadruped after birth: formerly it circulated from the extremity to the head; it now pursues a course directly opposite.

The quantity of food taken by these animals in their last state is comparatively small to what they antecedently devoured. For a short time after their appearance on the wing, their excrements are voided in a greater quantity, and are red like blood; this is, perhaps, the remains of that food which they contained before their late change. The appearance of this substance on the surface of the earth has at different times been regarded as portentous of some heavy calamity, being supposed to be blood that had dropt from the clouds.

Some of these animals are gregarious, and live in society during every stage of their existence; others live in that state during one period of their existence only. The duration of their life is various, according to the weather; its warmth accelerates every step of their progress, and its cold retards all their developments: a worm produced in an early period of the summer lives only for three months, while the same species, if hatched a little later in the season, lives another year; hence Reaumur has devised a method of prolonging

the lives of these animals greatly beyond their natural course.

The butterflies of every species are extremely prolific; a single female at one birth produces several hundred eggs: and one of the most wonderful particulars in the history of these insects, is the precaution with which they provide for the security of their young; some species tear off even the down from their own bodies to supply them with a covering.

Various insects prey upon the butterfly, or hasten the approach of its dissolution. One or two species of ichneumon perforates the body of the insect while a caterpillar, and there deposits its eggs; and, although the caterpillar continues to live, and is metamorphosed into a chrysalid, no butterfly is produced from it, those internal parts that were essential to its perfection being consumed by the larves of the ichneumon. From the great fecundity and variety of the insects of this genus they probably would soon cover the surface of the earth, did not nature provide a bar to their increase by multiplying their enemies: hence they are destined to become the food of a great number of animals of various kinds, some of which swallow them entirely, others macerate their bodies; while many accomplish their destruction by gradually sucking their juices. A single pair of sparrows, in order to supply themselves and their young, may destroy, it has been calculated, three thousand three hundred and sixty butterflies in one week.

The variety and richness of the colours that adorn the greater part of this tribe, have made it an object of especial research by painters as well as by naturalists. In general the tropical climates that heighten the colours both in the plumage of birds, and the scales of fishes, offer the most gaudy specimens of the butterfly.—We have only space to detail an example or two.

1. *P. Priamus*. Wings indented, silky, upper pair above green with a black disk and edge, lower ones with from four to six black spots; thorax black, with three green spots: this insect measures more than six inches from wing's end to wing's end; the black is of a velvet softness, the silky wings peculiarly lustrous, and the green of the upper pair of the most beautiful grass hue. Linnæus regarded it as the most superb of the whole papilionaceous tribe. It is a native of Amboyna, and very rare. It arranges under the section Equites, Troes, or Trojans.

2. *P. Hector*. Wings tailed black, both surfaces of the same colour, the upper pair with an interrupted white band, lower ones with numerous crimson spots: head and upper margin of the thorax red. This, also, as its specific name imports, belongs to the same section, and is very appropriately named. It is a native of Asia, and highly beautiful.

3. *P. machaon*. Wings tailed, both surfaces alike, yellow with a brown border, in which are yellow lunulæ; angle of the tail fulvous. This is one of the very few of the section Equites that are natives of our own country. It

is commonly known among collectors of this tribe of insects by the name of the *swallow-tailed* butterfly, and is a very elegant species. It is generally found in the month of August on umbelliferous plants. The larve is solitary and glabrous; furnished with tentacles, annulate with black and green, and dotted with red; the pupe is yellowish.

4. *P. Apollo*. Wings entire, white, spotted with black; lower ones with four eyes above, and six beneath. This is also a beautiful insect, somewhat larger than our great cabbage butterfly; it inhabits Europe, and has been occasionally found in our own gardens. It belongs to the section *Parnassii*. The larve is solitary, furnished with tentacles, silky, black, with two red dots on the segment on each side; pupe slightly folliculate, ovate, blueish, with red dots on each side on the fore-part.

5. *P. Brassicæ*. Common large white, or cabbage butterfly. Wings rounded entire, white; tip of the upper pair brown, and (in the male) two brown spots. Inhabits Europe, and is known to every one. Larve cinereous, dotted with black, with three sulphur lines; tail black; pupe pale-green, with three yellow lines, and three globular segments. A species of the *Danai* section.

6. *P. Io*. Peacock butterfly. Wings angular, indented, fulvous, spotted with black, and a large blue eye in each. An elegant specimen, inhabiting Europe and our own country. It belongs to the division *nymphales*. The larve is spinous, black, dotted with white, legs ferruginous: pupe ten-toothed, green with gold-dots, bifid behind.

7. *P. Iris*. Wings indented, brown with a blue gloss, and whitish interrupted band on each side; all with a single eye; the eyes on the upper pair above blind. Found in our own gardens and in Europe generally: belongs also to the *nymphales*. The male is spotted with white on the upper wings, and is without the eye. The larve is green with two horns, and oblique pale lines; pupe greenish, bifid at the tip.

PAPILIONACEA. (*papilio*, a butterfly.)

In botany, a papilionaceous or butterfly-shaped corol.—Irregular, and usually four-petalled. The lower petal is shaped like a boat, and is called *carina* or *keel*: the upper petal, which spreads and rises upwards, is called *vexillum*, standard or banner: the two side ones stand singly, being separated by the keel, and are called *alæ*, the wings. The keel is sometimes split, and then this corol is properly five-petalled. These flowers form a natural class, called *papilionaceæ*; and are to be found in the fifty-fifth order of Linnæus's *Fragments*, and in the thirty-second of his *Natural Orders*. They are chiefly comprehended within the order *decandria*, of the class *diadelphia*, in the *Artificial System*. This is one of *Tournefort's* classes; and is the same with the *leguminosæ* of Ray and other authors. The pea being the most obvious of these, some call them *pea-blossomed* flowers.

PAPILLA. (*papilla*.) The nipple of the breast. See **NIPPLE**.

PAPILLÆ. This term is applied by anatomists to the fine terminations of nerves, &c. as the nervous papillæ of the tongue, skin, &c.

PAPILLARIS HERBA. See **LAMPANA**.

PAPILLARY. **PAPILLOUS.** *a.* (from *papilla*, Latin.) Having emulgent vessels, or resemblances of paps (*Derham*).

PAPIRIUS. This name was common to several eminent Romans, the most remarkable of whom are the following:—Carbo, a Roman consul, who undertook the defence of *Opimius*, who was accused of condemning and putting to death a number of citizens on mount *Aventinus* without the form of a trial. His client was acquitted.—2. A dictator, who ordered his master of horse to be put to death, because he had fought and conquered the enemies of the republic without his consent. The people interfered, and the dictator pardoned him. *Cursor* made war against the *Sabines*, and conquered them, and also triumphed over the *Samnites*. His great severity displeased the people. He flourished about 320 years before the Christian era.—3. Carbo, a friend of *Cinna* and *Marius*. He raised cabals against *Sylla* and *Pompey*, and was at last put to death by order of *Pompey*, after he had rendered himself odious by a tyrannical consulship, and after he had been proscribed by *Sylla*. 4. *Maso*, a consul who conquered *Sardinia* and *Corsica*, and reduced them into the form of a province. At his return to Rome, he was refused a triumph, upon which he introduced a triumphal procession, and walked with his victorious army to the capitol, wearing a crown of myrtle on his head. His example was afterwards followed by such generals as were refused a triumph by the Roman senate.

PAPISTS, are those who believe the pope or bishop of Rome to be the supreme pastor of the universal church, who profess to believe all the articles of pope *Pius's* creed, and who promise implicit obedience to the edicts of the church, especially the decrees of the council of *Trent*. See **POPE**, **TRENT**, and **NONCONFORMIST**.

PAPISTICAL. *a.* (from *papist*.) Popish; adherent to popery (*Whitgift*).

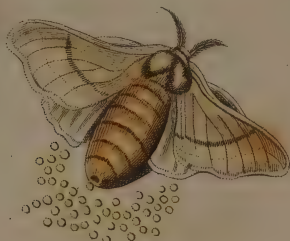
PAPISTRY. *s.* (from *papist*.) Popery; the doctrine of the *Romish* church (*Whitgift*).

PAPOUI (St.), a town of France, in the department of *Aude*, seated on the *Lembe*, eight miles E. of *Castlenaudary*, and 35 S.E. of *Toulouse*. Lon. 2. 10 E. Lat. 43. 21 N.

PAPPENHEIM, a town of *Franconia*, capital of a county of the same name, with a castle, where the count resides. It is seated near the *Altmal*, 17 miles N.W. of *Neuburg*, and 32 S. *Nuremburg*. Lon. 10. 51 E. Lat. 48. 58 N.

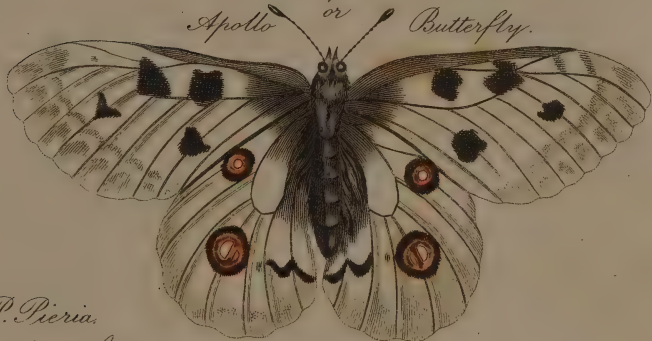
PAPPOPHORUM. In botany, a genus of the class *triandria*, order *digynia*. Calyx two-valved, two-flowered: corol two-valved, many-awned. One species, a native of *South America*, with branched culm; erect panicle; calyx from two to four-flowered.

Phalana.
P. Mori. Silk-worm Moth.

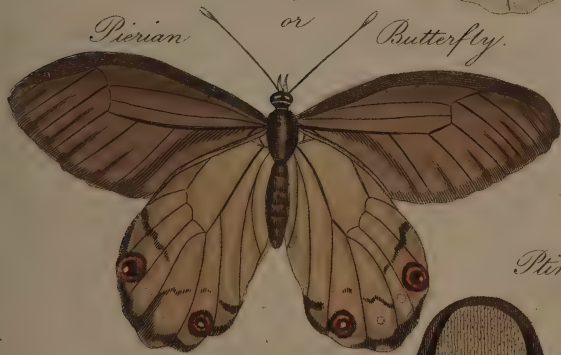


Papilio.

P. Apollo.
Apollo or *Butterfly.*



P. Pieris.
Pierian or *Butterfly.*



Pinus.



natural size.

magnified.

Pinus pulsator; or fatidicus Death-watch.

P A P

PAPPUS, a very eminent Greek mathematician of Alexandria towards the latter part of the 4th century, particularly mentioned by Suidas, who says he flourished under the emperor Theodosius the Great, who reigned from the year 379 to 395 of Christ. His writings shew him to have been a consummate mathematician. Many of his works are lost, or at least have not yet been discovered. Suidas mentions several of his works, as also Vossius de Scientiis Mathematicis. The principal of these are, his Mathematical Collections, in 8 books, the first and part of the second being lost. He wrote also a Commentary upon Ptolemy's Almagest; an Universal Chorography; A Description of the Rivers of Libya; a Treatise of Military Engines; Commentaries upon Aristarchus of Samos, concerning the Magnitude and Distance of the Sun and Moon; &c. Of these there have been published, the Mathematical Collections, in a Latin translation, with a large Commentary, by Commandine, in folio, 1588; and a second edition of the same in 1660. In 1644, Mersenne exhibited a kind of abridgment of them in his Synopsis Mathematica, in 4to: but this contains only such propositions as could be understood without figures. In 1655, Meibomius gave some of the Lemmata of the 7th book, in his Dialogue upon Proportions. In 1688, Dr. Wallis printed the last twelve propositions of the 2d book, at the end of his Aristarchus Samius. In 1703, Dr. David Gregory gave part of the preface of the 7th book in the Prolegomena to his Euclid. And in 1706, Dr. Halley gave that preface entire, in the beginning of his Apollonius.

The contents of his principal work, the Mathematical Collections, are exceedingly curious. The only account of them in the English language, with which we are acquainted, is given by Dr. Hutton in his valuable Mathematical Dictionary, to which we refer the inquisitive reader.

PAPPUS, (*pappus*.) The hair on the mid-
dle of the chin. See **CAPILLUS**.

PAPPUS, in botany, (anciently put for *senex*, an old man, whence it was applied to the down on the seed of thistles, &c. being like the gray hairs of old age.) Commonly translated down: but hence arises a confusion between this and the lanugo or tomentum on the surface of leaves, &c. which we usually call down. Pliny, however, will justify us in some degree: for speaking of the cactus (l. 21, c. 16.) he says—*Semen ei lanuginis, quam pappum vocant*. Some endeavour to get rid of this difficulty by translating *pappus*, the feather, but not successfully; for we cannot say a hairy feather and a feathered feather. The French name is *aigrette*. The ladies have adopted this term, and Mr. Martyn proposes to follow their example: if we call it seed-down, all confusion will be avoided.

Linnéus explains it to be—*corona* (seminis) *pennacea pilosave volitans*, a feathery or hairy flying crown to the seed. The first he calls

P A R

pappus plumosus; and indeed it resembles a feather in its structure: the second, *capillaris pilosus* or *simplex*; having the hairs undivided. (See **CAPILLARY**.) This crown is either placed immediately on the seed, and is then said to be *sesilis* or sessile; or else there is a thread interposed between it and the seed, which Linnéus calls *stipes*, and then it is said to be *stipitatus*, stipitate or stiped. This down or egret is one of nature's most obvious means of dispersing seeds to a considerable distance.

PAPPY, *a*. (from *pap*.) Soft; succulent; easily divided (*Burnet*).

PAPULÆ. (dim. of *pappa*, a dug or nipple.) In medicine, very small and accumulated elevations of the cuticle, with an inflamed base, not containing a fluid, nor tending to suppuration. The duration of papulæ is uncertain, but they terminate for the most part in scurf.

PAPULOSE LEAF. (*papula*, a pimple.) In botany, a pimplily, bladdery or blistered leaf. *Tectum punctis vesicularibus*. Covered with little blisters.

PAPYRUS. Paper-rush. See **CYPERUS**.

PAR, *s*. (Latin.) State of equality; equivalence; equal value (*Locke*).

PAR VAGUM. (*par*, *paris*, a pair.) In neurology, the eighth pair of nerves. They arise from the corpora olivaria of the medulla oblongata, and proceed into the neck, thorax, and abdomen. In the neck the *par vagum* gives off two branches, the lingual and superior laryngeal; and in the thorax four branches, the recurrent laryngeal, the cardiac, the pulmonary, and the œsophageal plexuses. At length the trunks of the *nervi vagi*, adjacent to the mediastinum, run into the stomach, and there form the stomachic plexus, which branches to the abdominal plexuses.

PARA. (*para*.) A preposition commencing many compound terms in medicine, and the collateral branches of science, and implying proximity in general, but more usually a proximity with inferiority—nearly, almost, something less or below: as *pareplegia*, a partial palsy; *paranoia*, defective or diminished judgment, alienation of mind; *paronychia*, an inflammation near the finger-nail.

PARABLE, a fable or allegorical instruction, founded on something real or apparent in nature or history, from which a moral is drawn by comparing it with something in which the people are more immediately concerned; such are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, &c. Dr. Blair observes, that "of parables, which form a part of allegory, the prophetic writings are full; and if to us they sometimes appear obscure, we must remember, that in those early times it was universally the mode throughout all the eastern nations to convey sacred truths under mysterious figures and representations."

PARABOLA, in geometry, a figure formed by the section of a cone, when cut by a plane parallel to a plane touching the slant side

of the cone. It is expressed by the equation $ax=y^2$, where a is the parameter, x the abscissa, y the corresponding semi-ordinate. See CONIC SECTIONS, and CURVES.

PARABOLAS OF THE HIGHER KINDS, are algebraic curves, defined by the general equation $a^{n-1}x=y^n$; that is, either $a^2x=y^3$, or $a^3x=y^4$, or $a^4x=y^5$, &c.

Some call these by the name of paraboloids; and in particular, if $a^2x=y^3$, they call it a cubical paraboloid; if $a^3x=y^4$, they call it a biquadratical paraboloid, or a sursolid paraboloid. In respect of these, the parabola of the first kind, above explained, they call the apollonian, or quadratic parabola.

Those curves are also to be referred to parabolas, that are expressed by the general equation $a^{m-1}x=y^m$, where the indices of the quantities on each side are equal, as before; and these are called semi-parabolas: as $ax^2=y^3$ the semi-cubical parabola; or $ax^3=y^4$ the semi-biquadratical parabola, &c.

They are all comprehended under the more general equation $a^m x = y^{m+n}$, where the two indices on one side are still equal to the index on the other side of the equation; which include both the former kinds of equations, as well as such as these following ones, $a^2x^2=y^4$, or $a^2x^3=y^5$, or $a^4x^3=y^7$, &c.

PARABOLA (Cartesian), is a curve of the 2d order expressed by the equation $xy=ax^3+bx^2+cx+d$, containing four infinite legs.

PARABOLA (Diverging), is a name given by Newton to a species of five different lines of the third order, expressed by the equation $y^2=ax^3+bx^2+cx+d$.

Of these the fifth is a parabola with two diverging legs, forming at their meeting a cusp or double point, being the case when the equation $0=ax^3+bx^2+cx+d$ has three equal roots; so that $py^2=x^3$ is the most simple equation of this curve, which indeed is the semi-cubical, or neilian parabola.

If a solid generated by the rotation of a semi-cubical parabola, about its axis, be cut by a plane, each of these five parabolas will be exhibited by its sections. For, when the cutting plane is oblique to the axis, but falls below it, the section is a diverging parabola, with an oval at its head. When oblique to the axis, but passes through the vertex, the section is a diverging parabola, having an infinitely small oval at its head. When the cutting is oblique to the axis, falls below it, and at the same time touches the curve surface of the solid, as well as cuts it, the section is a diverging parabola, with a nodus or knot. When the cutting plane falls above the vertex, either parallel or oblique to the axis, the section is a pure diverging parabola. And lastly when the cutting plane passes through the axis, the section is the semi-cubical parabola from which the solid was generated.

PARABOLIC ASYMPTOTE, is used for

a parabolic line approaching to a curve, so that they never meet; yet by producing both indefinitely, their distance from each other becomes less than any given line.

There may be as many different kinds of these asymptotes as there are parabolas of different orders. When a curve has a common parabola for its asymptote, the ratio of the subtangent to the absciss approaches continually to the ratio of 2 to 1, when the axis of the parabola coincides with the base; but this ratio of the subtangent to the absciss approaches to that of 1 to 2, when the axis is perpendicular to the base. And by observing the limit to which the ratio of the subtangent and absciss approaches, parabolic asymptotes of various kinds may be discovered. See MACLAURIN'S FLUXIONS, art. 337.

PARABOLIC CONOID, is a solid generated by the rotation of a parabola about its axis.

This solid is equal to half its circumscribed cylinder; and therefore if the base be multiplied by the height, half the product will be the solid content.

PARABOLIC PYRAMOID, is a solid figure thus named by Dr. Wallis, from its genesis, or formation, which is thus: let all the squares of the ordinates of a parabola be conceived to be so placed, that the axis shall pass perpendicularly through all their centres; then the aggregate of all these planes will form the parabolic pyramidoid.

This figure is equal to half its circumscribed parallelepipedon. And therefore the solid content is found by multiplying the base by the altitude, and taking half the product; or the one of these by half the other.

PARABOLIC SPACE, is the space or area included by the curve line and base or double ordinate of the parabola. The area of this space, as is proved by writers on the Parabola, is $\frac{2}{3}$ of its circumscribed parallelogram; which is its quadrature, and which was first found out by ARCHIMEDES, though some say by PYTHAGORAS.

PARABOLIC SPINDLE, is a solid figure conceived to be formed by the rotation of a parabola about its base or double ordinate.

This solid is equal to $\frac{8}{15}$ of its circumscribed cylinder.

PARABOLIC SPIRAL. See HELICOID PARABOLA.

PARABOLIC LEAF. In botany. Cujus diameter longitudinalis superat transversalem, & a basi sursum angustatur in semiovatum. Philos. Bot. Having the longitudinal diameter exceeding the transverse one, and narrowing from the base upwards into a half ovate. In Delin. Pl. it is not so fully expressed—versus apicem sensim angustius rotundatum. Rounded gradually towards the top into a narrower form.

PARABOLICAL. PARABOL'IC. *a.* (parabolique, Fr. from *parable*.) 1. Expressed by parable or similitude (Brown). 2. (from *parabola*.) Having the nature or form of a parabola (Ray).

PARABOLICALLY. *ad.* (from *parabolic.*) 1. By way of *parabole* or similitude (*Brown*). 2. In the form of a parabola.

PARABOLIFORM CURVES, a name sometimes given to the parabolas of the higher orders.

PARABOLOIDES, parabolas of the higher orders.

PARABOSCO (*Jerome*), an Italian dramatic writer of the 16th century: he was the author of several comedies in prose; and some novels in the style of Boccaccio, printed in 8vo. at Venice, 1558, under the title of *Diporti di Girolemo Parabosco*.

PARACELSUS, a celebrated chemist, was born at Einsfiden, in Switzerland, in 1493. His father was the natural son of a master of the Teutonic order, who possessing a good library, was enabled to assist the genius of his son in his early pursuits of learning. His first studies were devoted to physic and surgery; but he was captivated with, and ran into all the extravagances of alchemy. Making a visit to the mines, in Hungary, he had an opportunity of improving his knowledge in metallic chemistry. He went from Germany to Russia, was taken prisoner on the frontiers by the Tartars, and carried before the Cham, who valued his learning, and honoured him by choosing him to accompany his son, the prince, on an embassy to Constantinople, where, as he pretends, he was admitted to the secret of the philosopher's stone. His practice was obscured by a kind of empirical mystery; but his celebrity was increased by a daring use of the two powerful remedies mercury and opium; no wonder therefore that he was considered as an oracle in the venereal disease. The circumstance of his recovering the famous printer Frobenius of Basil, from a latent disorder, greatly increased his reputation, for he read professional lectures in that city. Notwithstanding Paracelsus vaunted of having discovered the philosopher's stone, he was compelled to sue the canon of Lichtenfels, for the amount of his bill; and although he affirmed that a man might live to the age of Methusalem, by the use of his elixir, he died at the age of 48. He gloried in overturning the system of Galen, though his own contained more absurdities than those of all the writers before him. (*Watkins*).

PARACENTESIS. (*paracentesis*, *παράκενσις*; from *παράκεναι*, to pierce through.) The operation of tapping to evacuate the water in ascites, dropsy of the ovary, uterus, &c.

PARACENTRIC MOTION, in astronomy, a term used for so much as a revolving planet approaches nearer to, or recedes farther from, the sun, or centre of attraction.

PARACHUTE, a kind of large and strong umbrella, contrived to break a person's fall from an air-balloon, should any accident happen to the balloon at a high elevation. This contrivance was first thought of by Blanchard, who at different times, by means of the parachute, let fall from his balloon dogs and other animals. He ventured even to descend in this

manner himself; but, whether from the bad construction of his parachute, or from falling among trees, he had the misfortune to break one of his legs. *Citizen* Garnerin, as he chooses to be called, was more successful. On the 21st of October 1797, he ascended from the garden de Mauisseux at half past five in the evening; between the balloon and the car, in which he sat, was placed the parachute, half opened, and forming a kind of tent over the aerial traveller; and when the whole apparatus was at a considerable height, he separated the parachute and car from the balloon. The parachute unfolding itself, was, by his weight and that of the car, drawn of course towards the earth. Its fall was at first rapid and vertical; but soon afterwards it exhibited a kind of balancing or vibration, and a rotation gradually increasing, which might be compared with that of a leaf falling from a tree. The aeronaut, however, reached the ground unhurt. See *ÆROSTATIA*.

This parachute was of cloth, and its diameter, when unfolded, about twenty-five feet. To use such instruments with success, it is necessary that the car be suspended at a considerable distance from the parachute, so as that the centre of gravity of the whole shall be vertically below the centre of resistance made by the air to the descent of the parachute; for if the car be otherwise placed, it is evident that the parachute will incline to one side, descend obliquely, oscillate, and the smallest irregularity in its figure will cause it to turn round its vertical axis.

PARACLET, the comforter, a name given the Holy Spirit, in the New Testament.

PARACOE. (from *παρά*, *dim.* and *ακουω*, to hear.) A dulness of hearing.

PARACUSIS. (*paracusis*, *παράκουσις*; from *παρά*, wrong, and *ακουω*, to hear.) Hearing depraved. Singing in the ears. A genus of disease in the class locales, and order dysæsthesiæ of Cullen: species, 1. *Paracusis imperfecta*, when existing sounds are not heard as usual. —2. *Paracusis imaginaria*, when imaginary sounds are heard.

PARADE. *s.* (*parade*, French.) 1. Show; ostentation (*Glanville*). 2. Procession; assembly of pomp (*Swift*). 3. Military order (*Milton*). 4. Place where troops draw up to do duty and mount guard. 5. Guard; posture of defence (*Locke*).

PARADIGM. *s.* (*παράδειγμα*.) Example.

PARADISE. *s.* (*παράδεισος*.) 1. The blissful regions, in which the first pair was placed (*Milton*). 2. Any place of felicity (*Shaks.*).

PARADISE is principally used for the garden of Eden, in which Adam and Eve were placed immediately upon their creation. As to this terrestrial paradise, there have been many inquiries about its situation. It has been placed in the third heaven, in the orb of the moon, in the moon itself, in the middle region of the air, above the earth, under the earth, in the place possessed by the Caspian sea, and under the arctic pole. The learned Huetius places it upon the river that is produced by the

conjunction of the Tigris and Euphrates, now called the river of the Arabs, between this conjunction and the division made by the same river before it falls into the Persian sea. Other geographers have placed it in Armenia, between the sources of the Tigris, the Euphrates, the Araxis, and the Phasis, which they suppose to be the four rivers described by Moses. But concerning the exact place we must necessarily be very uncertain, if indeed it can be thought at all to exist at present, considering the many changes which have taken place on the surface of the earth since the creation.

PARADISE (Bird of). See PARADISEA.

PARADISE (Tree of). See MUSA.

PARADISACAL. *a.* (from *paradise*.) Suited to paradise; making paradise (*Burnet*).

PARADISEA. Bird of paradise. In zoology, a genus of the class aves, order picæ. Bill covered with a belt of downy feathers at the base; feathers of the sides very long; two of the tail feathers naked. Twelve species, inhabitants of New Guinea or the Papuan Islands, or islands of the Indian ocean. The following are chiefly entitled to notice.

1. *P. apoda*. Greater paradise bird. Chestnut; neck beneath green gold; feathers on the sides longer than the body; two middle tail-feathers long, bristly.

Another variety, of smaller size; body above yellow; feathers on the sides yellowish white; the two long naked tail-feathers straight and tapering to the tip; the tail, as it is improperly called, is nothing more than the long feathers of the back and flanks. Inhabits the islands near New Guinea, and in the rainy season returns back to New Guinea; feeds on the larger moths and butterflies; flies in flocks, with a leader at the head, all making a noise like the thrush.

Concerning this bird the wild and most improbable fictions have been propagated. It has been said to be of divine origin, and its natural habitation to be the region of the Mosaic paradise.

It was formerly believed by the credulous and ignorant, the most numerous class of men, that it lived alone upon the air and the dew; that it had no entrails, nor feet; but remained perpetually floating upon the air, while sleeping, as well as while awake; while hatching and laying, as well as while procreating its young. Instead of a stomach and intestines, which, to so extraordinary a feeder, would have been useless, the cavity of its abdomen was said to be filled with fat. The hunters who procure and sell these birds cut off their legs, and take away their entrails, the better to preserve and carry them; and perhaps too with a view to perpetuate the belief of those fables, which they have found so beneficial to their trade.

If any thing could give an air of probability to the perpetual flying of the bird of paradise, it might be its extraordinary lightness. A bird no larger than a thrush, swelled to an immense bulk by its feathers, is rendered specifically lighter than any other. About forty or

fifty long feathers spring from each side, below the wing, which, mingling with those of the tail, augment the apparent size of the animal, without adding hardly any thing to its weight. However well qualified to support itself in the air, the bird of paradise is unable to direct its flight either across or in opposition to the wind; and it is observed to prefer those places which are most sheltered.

In some parts of India the feathers of this bird bring a great price. They are extremely well suited for the ornaments of dress, both by their lightness and their lustre. About a century ago, they were employed for the same purposes for which those of the ostrich are now purchased. In India, however, they derive their principal value from certain miraculous virtues which the priests have ascribed to them, and which have procured the animal to which they belong the title of the bird of God, *Manuco-Dewata*, whence Buffon has coined the modern French name by which they are known, *manucode*. It is doubted by Dr. Forster whether this bird may not have been the phoenix of antiquity; and it is certain that independently of the divine origin ascribed to both of them, they have other resemblances of traditionary character, yet there is nothing in any of the delineations of Aristotle or Pliny that will fairly apply to the elegant and magnificent bird before us. It was first imported into Europe about the year 1522, by Anthony Pigafetta, who accompanied Magellan in his voyage round the world: in one solitary instance it was imported in a living state into our own country: it had, however, lost all its beautiful floating side-feathers, and did not long survive its arrival.

2. *P. regia*. King of the birds of paradise. Chestnut purple; beneath whitish; a green-gold band on the breast; two middle tail-feathers filiform, feathered, semilunar at the tip; feathers under the wings longer than the rest; tail short, truncate. Inhabits, like the last, the islands of the Indian ocean, and returns to New Guinea in the rainy season; is less than the last, and much rarer; solitary, and seeks for red berries; from five to seven inches long.

3. *P. tristis*. Grackle bird of paradise. A triangular, naked space behind the eyes; head and neck brown; body brownish; first quill feathers white from the base to the middle; tail-feathers, except the middle ones, tipped with white. Inhabits the Philippine islands; nine and a half inches long: feeds on fruit, insects, mice, and every kind of grain; builds twice a year in the forked branches of trees; eggs four; when young is easily tamed, and becomes docile and imitative. This bird has a great affinity in all its habits to the grackle genus, yet on account of the downy feathers at the base of the bill it belongs to the present tribe. See Nat. Hist. Pl. CLXV.

PARADISI GRANA. See GRANA PARADISI.

PARADOX. (*Παράδοξον*, formed from *παρά*, against, and *δόξα*, opinion.) In philosophy

Long-tailed Paradise Bird.



Cardinalis.

Le Molucca, from Linnæus.



proposition seemingly absurd, because contrary to the received opinions; but yet true in effect.

PARADOXICAL. *a.* (from *paradox.*) 1. Having the nature of paradox (Norris). 2. Inclined to new tenets, or notions contrary to received opinions.

PARADOXICALLY. *ad.* (from *paradox.*) In a paradoxical manner (Collier).

PARADOXICALNESS. *s.* (from *paradox.*) State of being paradoxical.

PARADOXOLOGY. *s.* (from *paradox.*) The use of paradoxes (Brown).

PARAGO, or PALAWAN, a large island in the Indian ocean, between the Philippines and Borneo, which has a king, tributary to Borneo. The Spaniards have a fort here.

PARAGOGE. *s.* (παράγωγη.) A figure whereby a letter or syllable is added at the end of a word, without adding any thing to the sense of it: as, *vast, vastly.*

PARAGON. *s.* (*paragon*, from *parage*, equality, old French.) 1. A model; a pattern; something supremely excellent (Shakespeare). 2. Companion; fellow (Spenser).

To PARAGON. *v. a.* (*paragonner*, Fr.) 1. To compare; to parallel (Sidney). 2. To equal; to be equal to (Shakespeare).

PARAGRAPH. *s.* (*paragraphe*, French, παράγραφη.) A distinct part of a discourse (Swift).

PARAGRAPHICALLY. *ad.* (from *paragraph.*) By paragraphs.

PARAGUA, the most westerly of the Philippine islands, about 180 miles in length and 20 in breadth. Lon. 117. 44 E. Lat. 10. 0 N.

PARAGUAY, a large country of South America, bounded on the N. by Amazonia, E. by Brazil, S. by Patagonia, and W. by Chili and Peru. It contains six provinces; namely, Paraguay Proper, Parana, Guaria, Uruguay, Tucuman, and La Plata. It has numerous lakes and rivers: of the latter, the three principal are the Parana, Paraguay, and Uruguay; the united streams of which form the celebrated Rio de la Plata. These rivers annually overflow their banks; and on their recess leave them enriched by the slime, that renders the soil extremely fertile. This vast country is far from being wholly subdued or planted by the Spaniards; many parts being still unknown. The principal province of which we have any knowledge is La Plata, from which the whole country is also called La Plata. This province, with all the adjacent parts, is one continued plain for several hundred miles; extremely fertile, and producing cotton in great abundance, tobacco, and the valuable herb called Paraguay, which is peculiar to this country, and the infusion of which is drank, in all the Spanish provinces of South America, instead of tea. Here are also a variety of fruits and very rich pastures; but the country is destitute of woods. Cattle, sheep, horses, and mules are in great abundance; of the latter many thousands are annually sent to Peru. In the mountains towards Tucuman, the condor, the

largest bird of the vulture tribe, is not unfrequent; and the ostrich is found in the wide plains. Several independent tribes of indigenes live in the interior, on the Rio Grande; one of them, called Abipons, are a warlike race, and by a novelty in American manners, chiefly cavalry, securing and taming the wild horses introduced by the Spaniards. In 1515, the Spaniards discovered this country by sailing up Rio de la Plata, and, in 1535, founded the town of Buenos Ayres. In 1580 the jesuits were admitted into these fertile regions, and in the next century founded the famous missions of Paraguay; which were a number of colonies, each governed by two jesuits, one of whom was rector, the other his curate; and in process of time, merely by the most wonderful address, they acquired an absolute dominion, both spiritual and temporal, over the natives. In 1757, Spain exchanged the colonies on the E. shore of the Uruguay for the Portuguese colony of St. Sacrament, which caused that river to become the boundary of the respective possessions of the two crowns. In 1767, the court expelled the jesuits, and the natives were put upon the same footing with the other Indians of the Spanish part of South America. Buenos Ayres is the capital.

PARAIBA, a province of Brasil, between those of Rio Grande and Tamarica. It abounds in sugar-canes, brasil-wood, tobacco, and cotton. The chief town is of the same name, and seated on the river Paraiba. The Dutch got possession of it in 1635, and fortified it with a slight rampart; but the Portuguese retook it soon after. Lon. 49. 53 W. Lat. 6. 50 S.

PARALEPSIS. (Παραλείψις.) In rhetoric, a pretence of omitting, or passing over a thing, and yet expressing it by the way.

PARALIPOMENA. (Παραλίπομενα.) A supplement of things omitted, or forgot, in some preceding work, or treatise.

The word is formed from the Greek *παράλειπω*, *prætermitto*, I pass by. Some authors use the word *subrelictum* instead of *paralipomenon*.

PARALLACTIC, in general, something relating to the parallax of heavenly bodies. See **PARALLAX**.

PARALLAX, in astronomy, is the difference between the places of any celestial object as seen from the surface, and from the centre of the earth at the same instant.

Let E in figure 2 of parallax given in plate 129 represent the centre of the earth, O the place of an observer on its surface, whose visible horizon is OH, and true horizon EF. Now let ZDT be a portion of a great circle in the heavens, and A the place of any object in the visible horizon; join EA, and produce it to C; then C is the true place of the object, and H is its apparent place, and the angle CAH is the parallax; or, because the object is in the horizon, it is called the horizontal parallax. But OAE, the angle which the earth's radius subtends at the object, is equal to CAH: hence the horizontal parallax of an object may be defined to be the angle which the earth's semi-diameter subtends at that object.

PARALLAX.

The whole effect of parallax is in a vertical direction: for the parallactic angle is in the plane passing through the observer and the earth's centre; which plane is necessarily perpendicular to the horizon, the earth being considered a sphere.

The more elevated an object is above the horizon, the less is the parallax, its distance from the earth's centre continuing the same. When the object is in the zenith, it has no parallax; but when in the horizon, its parallax is greatest. The horizontal parallax being given, the parallax at any given altitude may be found by the following rule:

To the logarithmic cosine of the given altitude, add the logarithmic sine of the horizontal parallax, the sum, rejecting 10 from the index, will be the logarithmic sine of the parallax in altitude.

Demonstration.—Let B be the place of an object; produce OB, ED to F; and D to G; then the angle BOZ will be the apparent altitude of the object, BEZ the true altitude, and OBE the parallax in altitude. Now in the triangle AOE,

$$R : \text{sine OAE} :: \text{EA} : \text{EO}.$$

And in the triangle OBE

$$\text{BE} (= \text{EA}) : \text{EO} :: \text{sine BOE} : \text{sine OBE}.$$

$$\text{Hence } R : \text{cosine BOA} :: \text{sine OAE} : \text{sine OBE}.$$

As the two last terms are generally small quantities, the arch may be substituted in place of its sine without any sensible error.

Example.—Let the apparent altitude of the moon's centre be $39^{\circ} 25'$, and the moon's horizontal parallax $56' 54''$. Required the parallax in altitude? Moon's apparent alt. $39^{\circ} 25'$ cosine 9.8879260
Moon's horizontal par. $56' 54''$ sine 8.2188186

Moon's par. in altitude $43' 57''$ sine 8.1067446

As the apparent place of an object is nearer the horizon than its true place, the parallax is therefore to be added to the apparent altitude, to obtain the true altitude. Hence also an object will appear to rise later and set sooner.

The sine of the parallax of an object is inversely as its distance from the earth's centre.

Demonstration.—Let A be the place of an object, and H the place of the same object at another time, or that of another object at the same instant; join EH, then in the triangles AOE, HOE,

$$R : \text{sine OAE} :: \text{AE} : \text{OE}$$

$$\text{sine OHE} : R :: \text{OE} : \text{EH}.$$

$$\text{Hence sine OHE} : \text{sine OAE} :: \text{AE} : \text{EH}.$$

The parallax of an object makes it appear more distant from the meridian than it really is.

Demonstration.—The true and apparent places of an object are in the same vertical, the apparent place being lower than the true; and all verticals meet at the zenith: hence the apparent place of an object is more distant from the plane of the meridian than the true place.

The longitude, latitude, right ascension, and declination of an object are affected by parallax. The difference between the true and apparent longitudes is called the parallax in longitude; in like manner, the differences between the true and apparent latitudes, right ascensions, and declinations, are called the parallax in latitude, right ascension, and declination, respectively.—When the object is in the nonagesimal, the parallax in longitude is nothing, but that in latitude is greatest: and when the object is in the meridian, the parallax in right ascension vanishes, and that in declination is a maximum. The apparent longitude is greater than the true longitude, when the object is east of the nonagesimal, otherwise less; and when the object is in the eastern hemisphere, the apparent right ascension exceeds the true, but is less than the true right ascen-

sion when the object is in the western hemisphere. The apparent place of an object is more distant from the elevated poles of the ecliptic and equator than the true place: hence, when the latitude of the place and elevated pole of the ecliptic are of the same name, the apparent latitude is less than the true latitude, otherwise greater; and the apparent declination will be less or greater than the true declination, according as the latitude of the place and declination of the object are of the same or of a contrary denomination.

The parallaxes in longitude, latitude, right ascension, and declination, in the spheroidal hypothesis, may be found by the following formulæ; in which L represents the latitude of the place, diminished by the angle contained between the vertical and radius of the given place; P the horizontal parallax for that place: a the altitude of the nonagesimal at the given instant; d the apparent distance of the object from the nonagesimal; λ the true and apparent latitudes of the objects; $D\delta$ the true and apparent declinations respectively; and m its apparent distance from the meridian.

Then par. in long. = $P \cdot \text{sine } a \cdot \text{sine } d \cdot \text{secant } l$, to radius unity; and par. in lat. = $P \cdot \text{cosine } a \cdot \text{cosine } \lambda \pm P \cdot \text{cosine } d \cdot \text{sine } a \cdot \text{sine } \lambda$.

The sign — is used when the apparent distance of the object from the nonagesimal and from the elevated pole of the ecliptic is of the same affection, and the sign + if of different affection. If the greatest precision be required, the following quantity $0.00000121216 \cdot \text{par. lon.}^2 \cdot \text{sine } 2l$, is to be applied to the parallax in latitude found as above, by addition or subtraction, according as the true distance of the object from the elevated pole of the ecliptic is greater or less than 90° .

Again, par. in right ascen. = $P \cdot \text{cosine } L \cdot \text{sine } m \cdot \text{secant } D$, to radius unity; and par. in declination = $P \cdot \text{sine } L \cdot \text{cosine } \delta \pm P \cdot \text{cosine } L \cdot \text{sine } \delta \cdot \text{cosine } m$.

The upper or lower sign is to be used according as the distance of the object from the meridian and from the elevated pole of the equator is of the same or different affection. Part 2d of par. in declination = $0.00000121216 \cdot \text{par. in right ascen.}^2 \cdot \text{sine } 2D$; which is additive to, or subtractive from, part first of parallax in declination, according as the true distance of the object from the elevated pole of the equator is greater or less than 90° .

The parallax always diminishes the altitude of a phenomenon, or makes it appear lower than it would do if viewed from the centre of the earth; and this change of the altitude may, according to the different situation of the ecliptic and equator in respect of the horizon of the spectator, cause a change of the latitude, longitude, declination, and right ascension of any phenomenon, which is called their parallax. The parallax, therefore, increases the right and oblique ascension; diminishes the descension; diminishes the northern declination and latitude in the eastern part, and increases them in the western; but increases the southern both in the eastern and western part; diminishes the longitude in the western part, and increases it in the eastern. Hence it appears, that the parallax has just opposite effects to refraction.

PARALLAX (Annual), the change of the apparent place of a heavenly body, which is caused by being viewed from the earth in different parts of its orbit round the sun. The annual parallax of all the planets is found very considerable, but that of the fixed stars is imperceptible.

To observe the Moon's Parallax.—Observe very accurately the moon's meridian altitude, and note

PARALLAX.

the moment of time. To this time, equated, compute her true latitude and longitude, and from these find her declination; also from her declination, and the elevation of the equator, find her true meridian altitude. Subtract the refraction from the observed altitude: then the difference between the remainder and the true altitude will be the parallax sought. If the observed altitude be not meridional, reduce it to the true altitude for the time of observation.

By this means, in 1583, Oct. 12 day 5h. 19 m. from the moon's meridian altitude observed at $13^{\circ} 38'$, Tycho found her parallax to be 54 minutes.

To observe the Moon's Parallax in an Eclipse.—In an eclipse of the moon observe when both horns are in the same vertical circle, and at that moment take the altitudes of both horns; then half their sum will be nearly the apparent altitude of the moon's centre; from which subtract the refraction, which gives the apparent altitude freed from refraction. But the true altitude is nearly equal to the altitude of the centre of the shadow at that time; now the altitude of the centre of the shadow is known, because we know the sun's place in the ecliptic, and his depression below the horizon, which is equal to the altitude of the opposite point of the ecliptic, in which the centre of the shadow is. Having thus the true and apparent altitudes, their difference is the parallax sought.

De la Hire makes the greatest horizontal parallax $1^{\circ} 1' 25''$, and the least $54' 5''$. M. le Monnier determined the mean parallax of the moon to be $57' 12''$. Others have made it $57' 18''$.

In the Philosophical Transactions for 1764, there is given a very ingenious method by Dr. Murdoch for finding the moon's parallax and distance, from the received principles of gravitation. He thence finds the mean horizontal parallax at the equator $57' 12'' 34$, supposing the earth immovable; and $56' 44'' 07$, supposing the earth and moon to revolve about their common centre of gravity.

To observe the Parallax of Mars.—1. Suppose Mars in the meridian and equator at H; and that the observer, under the equator in A, observes him culminating with some fixed star. 2. If now the observer were in the centre of the earth, he would see Mars constantly in the same point of the heavens with the star; and therefore, together with it, in the plane of the horizon, or of the 6th hour; but since Mars here has some sensible parallax, and the fixed star has none, Mars will be seen in the horizon, when in P, the plane of the sensible horizon; and the star, when in R, the plane of the true horizon: therefore observe the time between the transit of Mars and of the star through the plane of the 6th hour.—3. Convert this time into minutes of the equator, at the rate of 15 degrees to the hour; by which means there will be obtained the arch PM, to which the angle PAM, and consequently the angle AMD, is nearly equal; which is the horizontal parallax of Mars. (Pl. 129, fig. 3).

If the observer be not under the equator, but in a parallel IQ, that difference will be a less arch QM: wherefore, since the small arches QM and PM are nearly as their sines AD and ID; and since ADG is equal to the distance of the place from the equator, i. e. to the elevation of the pole, or the latitude; therefore AD to ID, as radius to the cosine of the latitude; say, as the cosine of the latitude ID is to radius, so is the parallax observed in I, to the parallax under the equator.

Since Mars and the fixed star cannot be com-

modiously observed in the horizon; let them be observed in the circle of the 3d hour: and since the parallax observed there TO, is to the horizontal one PM, as IS to ID: say, as the sine of the angle IDS, or 45° (since the plane DO is in the middle between the meridian DH and the true horizon DM), is to radius, so is the parallax TO to the horizontal parallax PM.

If Mars be likewise out of the plane of the equator, the parallax found will be an arch of a parallel; which must therefore be reduced, as above, to an arch of the equator.

Lastly, if Mars be not stationary, but either direct or retrograde, by observations for several days find out what his motion is every hour; that his true place from the centre may be assigned for any given time.

By this method Cassini, who was the author of it, observed the greatest horizontal parallax of Mars to be $25''$; but Mr. Flamsteed found it near $36''$. Cassini observed also the parallax of Venus by the same method.

To find the Sun's Parallax.—The great distance of the sun renders his parallax too small to fall under even the nicest immediate observation. Many attempts have indeed been made; both by the ancients and moderns, and many methods invented for that purpose. The first was that of Hipparchus, which was followed by Ptolemy, &c. and was founded on the observation of lunar eclipses. The second was that of Aristarchus, in which the angle subtended by the semi-diameter of the moon's orbit, seen from the sun, was sought from the lunar phases. But these both proving deficient, astronomers are now forced to have recourse to the parallaxes of the nearer planets, Mars and Venus. Now from the theory of the motions of the earth and planets, there is known at any time the proportion of the distances of the sun and planets from us; and the horizontal parallaxes being reciprocally proportional to those distances; by knowing the parallax of a planet, that of the sun may be thence found.

Thus Mars, when opposite to the sun, is twice as near as the sun is, and therefore his parallax will be twice as great as that of the sun. And Venus, when in her inferior conjunction with the sun, is sometimes nearer us than he is; and therefore her parallax is greater in the same proportion. Thus, from the parallaxes of Mars and Venus, Cassini found the sun's parallax to be $10''$; from whence his distance comes out 22000 semi-diameters of the earth.

But the most accurate method of determining the parallaxes of these planets, and thence the parallax of the sun, is that of observing their transit. However, Mercury, though frequently to be seen on the sun, is not fit for this purpose; because he is so near the sun, that the difference of their parallaxes is always less than the solar parallax required. But the parallax of Venus, being almost four times as great as the solar parallax, will cause very sensible differences between the times in which she will seem to be passing over the sun at different parts of the earth. With the view of engaging the attention of astronomers to this method of determining the sun's parallax, Dr. Halley communicated to the Royal Society, in 1691, a paper containing an account of the several years in which such a transit may happen, computed from the tables which were then in use: those at the ascending node occur in the month of November O. S. in the years 918, 1161, 1396, 1631, 1639, 1874, 2109, 2117; and

at the descending node in May O. S. in the years 1048, 1283, 1291, 1518, 1526, 1761, 1769, 1996, 2004.

Mr. Short with great labour deduced the quantity of the sun's parallax from the best observations that were made of the transit of Venus, on the 6th of June, 1761 (for which see Phil. Trans. vol. 51 and 52), both in Britain and in foreign parts, and found it to have been $8''.52$ on the day of the transit, when the sun was very nearly at his greatest distance from the earth; and, consequently, $8''.65$ when the sun is at his mean distance from the earth. See Philos. Trans. vol. 52, p. 611, &c. Whence,

As $\sin. 8''.65$	log. 5.6219140
to radius	10.0000000
So is 1 semidiameter	0.0000000
to 23882.84 semidiameters	4.3780660

that is, 23882 $\frac{84}{100}$ is the number of the earth's semidiameters contained in its distance from the sun; and this number of semidiameters being multiplied by 3985, the number of English miles contained in the earth's semidiameter (though later observations make this semidiameter only 3955 $\frac{1}{2}$ miles), there is obtained 95,173,127 miles for the earth's mean distance from the sun. And hence, from the analogies under the article DISTANCE, the mean distances of all the rest of the planets from the sun, in miles, are found as follow, viz.

Mercury's distance	36,841,468
Venus's distance	68,891,486
Mars's distance	145,014,148
Jupiter's distance	494,990,976
Saturn's distance	907,956,130

In another paper (Philos. Trans. vol. 53, p. 169) Mr. Short states the mean horizontal parallax of the sun at $8''.69$. And Dr. Hornsby, from several observations of the transit of June 3d, 1769 (for which see the Philos. Trans. vol. 59) deduces the sun's parallax for that day equal to $8''.65$, and the mean parallax $8''.78$; whence he makes the mean distance of the earth from the sun to be 93,726,900 English miles, and the distances of the other planets thus:

Mercury's distance - - -	36,281,700
Venus's distance - - -	67,795,500
Mars's distance - - -	142,818,000
Jupiter's distance - - -	487,472,000
Saturn's distance - - -	804,162,000

See the Philos. Trans. vol. 61, p. 572.

But others, by taking the results of those observations that are most to be depended on, have made the sun's parallax at his mean distance from the earth to be $8''.6045$; and some make it only 8.54 . According to the former of these, the sun's mean distance from the earth is 95,109,736 miles; and according to the latter it is 95,834,742 miles. For a detailed account of the methods employed on this occasion, see the treatises on astronomy by Ferguson, O. Gregory, and Vince.

Laplace has explained a method in his Mécanique Céleste of determining the sun's parallax by means of a lunar inequality, which depends upon the distance of the earth and sun. His result is $26''.4205$ of the new French division, or $8''.50024$ of the sexagesimal scale: and this gives 24096 radii of the earth for the sun's mean distance. See Méc. Céleste, tom. iii. p. 281, 282.

PARALLEL. α. (παράλληλος.) 1. Extended in the same direction, and preserving always

the same distance (*Brown*). 2. Having the same tendency (*Addison*). 3. Continuing the resemblance through many particulars; equal (*Watts*).

PARALLEL, in geometry, an appellation given to lines, surfaces, and bodies, every where equidistant from each other. See GEOMETRY.

PARALLEL SPHERE, that situation of the sphere wherein the equator coincides with the horizon, and the poles with the zenith and nadir.

PARALLEL SAILING. See NAVIGATION.

PARALLELS OF LATITUDE, in astronomy, are lesser circles of the sphere parallel to the ecliptic, imagined to pass through every degree and minute of the colures.

PARALLELS OF ALTITUDE, or **ALMUCANTARS**, are circles parallel to the horizon, imagined to pass through every degree and minute of the meridian between the horizon and zenith, having their poles in the zenith.

PARALLELS OF DECLINATION, in astronomy, are the same with parallels of latitude in geography.

PARALLEL. s. (from the adjective.) 1. Line continuing its course, and still remaining at the same distance from another line (*Pope*). 2. Line on the globe marking the latitude. 3. Direction conformable to that of another line (*Garth*). 4. Resemblance; likeness; conformity continued through many particulars (*Denham*). 5. Comparison made (*Addison*). 6. Any thing resembling another (*South*).

To PARALLEL. v. a. (from the noun.) 1. To place so as always to keep the same direction with another line (*Brown*). 2. To keep in the same direction; to level. 3. To correspond to (*Burnet*). 4. To be equal to; to resemble through many particulars (*Dryden*). 5. To compare (*Locke*).

PARALLEL RULER, an instrument consisting of two wooden, brass, &c. rulers equally broad every where; and so joined together by the cross blades, pl. 129, fig. 4. as to open to different intervals, accede and recede, and yet still retain their parallelism.

The use of this instrument is obvious; for one of the rulers being applied to RS, and the other withdrawn to a given point V, a right angle AB, drawn by its edge, through V, is a parallel to RS.

PARALLELISM, the quality of a parallel, or that which denominates it such. Or it is that by which two things, as lines, rays, or the like, become equidistant from one another.

PARALLELISM OF THE EARTH'S AXIS, is that invariable situation of the axis, in the progress of the earth through the annual orbit, by which it always keeps parallel to itself; so that if a line be drawn parallel to its axis, while in any one position; the axis, in all other positions or parts of the orbit, will always be parallel to the same line.

In consequence of this parallelism, the axis of the earth points always, as to sense, to the

same place or point in the heavens, viz. to the poles. Because, though really the axis, in the annual motion, describes the surface of a cylinder, whose base is the circle of the earth's annual orbit, yet this whole circle is but as a point in comparison with the distance of the fixed stars; and therefore all the sides of the cylinder seem to tend to the same point, which is the celestial pole. To this parallelism is owing the change and variety of seasons, with the inequality of days and nights.

This parallelism is the necessary consequence of the earth's double motion; the one round the sun, the other round its own axis. Nor is there any necessity to imagine a third motion, as some have done, to account for this parallelism.

PARALLELISM OF ROWS OF TREES. The eye placed at the end of an alley bounded by two rows of trees, planted in parallel lines, never sees them parallel, but always inclining to each other, towards the farther end.

Hence mathematicians have taken occasion to enquire, in what lines the trees must be disposed, to correct this effect of the perspective, and make the rows still appear parallel. And, to produce this effect, it is evident that the unequal intervals of any two opposite or corresponding trees may be seen under equal visual angles.

For this purpose, M. Fabry, Tacquet, and Varignon observe, that the rows must be opposite semi-hyperbolas. See the Mem. Acad. Sciences, an. 1715.

But notwithstanding the ingenuity of their speculations, it has been proved by D'Alembert and Bouguer, that to produce the effect proposed, the trees are to be ranged merely in two diverging right lines.

PARALLELOGRAM, in geometry, is a quadrilateral right-lined figure, whose opposite sides are parallel to each other.

A parallelogram may be conceived as generated by the motion of a right line, along a plane, always parallel to itself.

Parallelograms have several particular denominations, and are of several species, according to certain particular circumstances, as follows:

When the angles of the parallelogram are right ones it is called a rectangle.—When the angles are right, and all its sides equal, it is a square.—When the sides are equal, but the angles oblique ones, the figure is a rhombus or lozenge. And when both the sides and angles are unequal, it is a rhomboides.

PARALLELOGRAM OF THE HYPERBOLA, is the parallelogram formed by the two asymptotes of an hyperbola, and the parallels to them, drawn from any point of the curve. This term was first used by Huygens, at the end of his *Dissertatio de Causa Gravitatis*. This parallelogram, so formed, is of an invariable magnitude in the same hyperbola; and the rectangle of its sides is equal to the power of the hyperbola.

This parallelogram is also the modulus of

the logarithmic system; and if it be taken as unity or 1, the hyperbolic sectors and segments will correspond to Napier's or the natural logarithms; for which reason these have been called the hyperbolic logarithms. If the parallelogram be taken = $.43429448190$, &c. these sectors and segments will represent Briggs's logarithms; in which case the two asymptotes of the hyperbola make between them an angle of $25^{\circ} 44' 25'' \frac{1}{2}$.

PARALLELOGRAM OF FORCES, a term used to designate the parallelogram employed in the fundamental proposition of statics: viz. any two forces having the ratio and the direction of the sides of a parallelogram, have their equivalent or resulting force measured by the diagonal of that parallelogram, and in the direction of it. See **STATICS**.

PARALLELOGRAMICAL. *a.* (from *parallelogram*.) Having the properties of a parallelogram.

PARALLELOPIPED. *s.* (*parallelopede*, Fr.) A solid figure contained under six parallelograms, the opposite of which are equal and parallel; or it is a prism, whose base is a parallelogram: it is always triple to a pyramid of the same base and height (*Newton*).

PARALOGISM. *s.* (*παράλογισμος*.) A false argument (*Arbutnot*).

PARALOGY. *s.* False reasoning (*Brown*).

PARALYSIS. (*paralysis*, *παράλυσις*; from *παράλω*, to loose). The palsy. A genus of disease in the class neuroses, and order comata, of Cullen, known by a loss of the power of voluntary motion, affecting certain parts: species, 1. Paralysis partialis, partial, or palsy of some particular muscles. 2. Paralysis hemiplegica, palsy of one side. 3. Paralysis paraplegica, palsy of one half of the body. Paralysis venenata, from the sedative effects of poisons. Paralysis is also symptomatic of several diseases, as worms, scrophula, syphilis, &c.

PARALYSISHERBA. (*paralysis*, *παράλυσις*; from *παράλω*, to weaken; so called from its use in paralytic disorders). The cowslip and primrose are sometimes so termed. See **PRIMULA VERIS**, and **PRIMULA VULGARIS**.

PARALYTICAL. **PARALYTIC**. *a.* (from *paralysis*; *paralytique*, Fr.) Palsied; inclined to palsy (*Prior*).

PARAMARIBO, the capital of Surinam, in Guiana, and the chief place of the Dutch colonies in South America. It has a small but strong citadel; and a noble road for shipping, where there are seldom less than 80 vessels loading coffee, sugar, cotton, and indigo. The streets are straight, and lined with orange, shaddock, tamarind, and lemon trees, in continual bloom. It surrendered to the English in 1799, and in 1803. It is situate on the E. side of the river Surinam, 16 miles from its mouth. Lon. 55. 25 W. Lat. 5. 48 N.

PARAMECIUM, in zoology, a genus of the class vermes, order infusoria. Worm invisible to the naked eye, simple, pellucid, flattened, oblong. Seven species, found chiefly in

fresh stagnant water, or infusions, one in salt water. The following are principally entitled to notice.

1. *P. aurelia*. Compressed, longitudinally plaited towards the fore part, acute behind. Found in ditch waters and infusions; membranaceous; four times as long as it is broad, the fore part obtuse, hyaline, the hind part filled with molecules; the fold reaching from the middle to the tip.

2. *P. chrysalis*. Cylindrical, longitudinally plaited on the fore part, and obtuse behind. Found in salt water, resembles the last, but is more obtuse behind; the margins filled with black globules.

3. *P. acutum*. Tail two-edged, head acute. Found in stagnant water, in which duck-weed abounds; slow of motion, continually agitating the tail.

PARAMESE. (Greek.) The name applied by the ancients to the second sound of the second octave, because next in degree to the middle sound of their great system, or diagram. The paramese corresponded with our *B* above the fifth line in the bass.

PARAMETER, in conic sections, a constant line, otherwise called *latus rectum*. The parameter is said to be constant, because in the parabola, the rectangle under it and any absciss, is always equal to the square of the corresponding semi-ordinate; and in the ellipsis and hyperbola, it is a third proportional to the conjugate and transverse axis.

If *t* and *c* be the two axes in the ellipse and hyperbola, and *x* and *y* an absciss and its ordinate in the parabola: then

$t : c :: c : p = \frac{c^2}{t}$ = the parameter in the former;

$x : y :: y : p = \frac{y^2}{x}$ = the parameter in the last.

The parameter is equal to the double ordinate drawn through the focus of one of the three conic sections.

PARAMO (Louis de) a Spanish inquisitor, published at Madrid, 1598, in folio, a rare and curious work upon the tribunal, called The Holy Office. The author wrote with great candour, is exact in his dates, omitting no interesting fact, and enumerating without scruple all the victims who had suffered under the abominable inquisition.

PARAMOUNT. *a.* (*per* and *mount*.) 1. Superiour; having the highest jurisdiction: as, lord paramount, the chief of the seigniorie (*Glanville*). 2. Eminent; of the highest order (*Bacon*).

PARAMOUNT. *s.* The chief (*Milton*).

PARAMOUR. *s.* (*par* and *amour*, Fr.) 1. A lover or wooer (*Spenser*). 2. A mistress (*Shakspeare*).

PARANETE DIEZEUGMENON. (Gr.) The name by which the ancients distinguished the third string of the fourth tetrachord, the tone of which was equivalent to our *p* under the first line in the treble cliff.

PARANETE HYPERBOLÆON. (Greek.) The name given by the ancients to the penultima of the supreme, or fifth tetrachord. This sound corresponded with our treble-cliff note on the second line.

PARANETE SYNEMMENON. (Greek.) The appellation given by the ancients to the penultima, or last sound but one, of the third tetrachord. This sound corresponded with our *c* on the first ledger line in the base.

PARANYMPH. *s.* (*παρά and νύμφη*.) 1. A bride-man; one who leads the bride to her marriage (*Milton*). 2. One who countenances or supports another (*Taylor*).

PARAPEGM. *s.* (*παράπηγμ.*) A brazen table fixed to a pillar, on which laws and proclamations were anciently engraved; also a table, containing an account of the rising and setting of the stars, eclipses of the sun and moon, the seasons of the year, &c. (*Philips*).

PARAPET, in fortification, an elevation of earth designed for covering the soldiers from the enemies' cannon or small shot. The thickness of the parapet is from eighteen to twenty feet; its height is six feet on the inside, and four or five on the outside. It is raised on the rampart, and has a slope above called the superior talus, and sometimes the glacis of the parapet. The exterior talus of the parapet is the slope facing the country; there is a banquette or two for the soldiers who defend the parapet, to mount upon, that they may the better discover the country, fosse, and counterscarpe, and fire as they find occasion. Parapet of the covert-way, or corridor, is what covers that way from the sight of the enemy, which renders it the most dangerous place for the besiegers, because of the neighbourhood of the faces, flanks, and curtains of the place.

PARAPET is also a little wall raised breast high, on the banks of bridges, keys, or high buildings, to serve as a stay, and prevent people's falling over.

PARAPH, a particular character, knot, or flourish, which people habituate themselves to make always in the same manner at the end of their name, to prevent their signature from being counterfeited.

The paraph of the kings of France was a grate, which the secretaries always placed before their own, in all letters, &c. Menage derives the word from *paragraphe*.

PARAPHERNALIA, or **PARAPHERNA**, in the civil law, those goods which a wife brought her husband, besides her dower, and which were still to remain at her disposal, exclusive of her husband, unless there was some provision made to the contrary in the marriage-contract.

The word is formed from the Greek *παρά*, beyond, or over, and *περί*, dos, dower. In *his rebus quas extru dotem mulier habet, et quas Greci παραπερνα vocant, nullam, uxore prohibente, vir habeat communionem*.

PARAPHIMOSIS. (*paraphimosis*, *παρεφίμωσις*; from *παρά*, about, and *φίμωσις*, to bend.) In surgery, a disorder in which the prepuce being retracted toward the root of the penis,

cannot be returned over the glans, but makes a sort of ligature behind the corona. This disease is easily known; the glans is uncovered, the skin tumefied on the corona, and above it forms a circular collar or stricture, which, from the skin being unequally extended, becomes indented, and makes several rings round the part. This disease may proceed from two causes; as first from the imprudence of young people, and sometimes also of grown persons, who having the end of their prepuce too straight, cannot uncover their glans without pain, and when they have done it, neglect to return it so soon as they ought; whence the contracted part of the prepuce forms a constriction behind the glans. Soon after, the glans and penis swell, and the prepuce being consequently very much distended, is affected in the same manner; an inflammation seizes upon both, and swellings quickly appear upon the stricture formed by the prepuce, so that the whole may be liable to a gangrene, if not speedily relieved. The second thing that may produce a paraphymosis is a venereal virus. In adults, whose glans is uncovered, there frequently arise venereal chancres in the prepuce after impure coition, which before they digest, are generally attended with inflammation, more or less considerable. This inflammation is alone sufficient to render the prepuce too strait for the size of the penis, in consequence of which a swelling or inoculation may ensue like that before mentioned; and this is what is termed a paraphymosis, or paraphimosis.

PARAPHONIA. (*paraphonia*, παραφωνία; from παρα, wrong, and φωνη, sound). Alteration of the voice. A genus of disease in the class locales, and order dyscinesia of Cullen, comprehending six species, viz. paraphonia puberum, paraphonia rauca, paraphonia resonans, paraphonia palatina, paraphonia clangens, and paraphonia comatosa.

PARAPHRASE, an explanation of some text, in clearer and more ample terms, whereby is supplied what the author might have said or thought on the subject; such are esteemed Erasmus's Paraphrase on the New Testament, the Chaldee Paraphrase on the Pentateuch, &c.

To PARAPHRASE. *v. a.* (παράφραζω; paraphraser, Fr.) To interpret with laxity of expression; to translate loosely (*Stillingfleet*).

PARAPHRAST. *s.* (παράφραστης; paraphraste, Fr.) A lax interpreter; one who explains in many words (*Hooker*).

PARAPHRASTICAL. **PARAPHRASTIC.** *a.* (from *paraphrase*.) Lax in interpretation; not literal; not verbal.

PARAPHRENITIS. (*paraphrenitis*, παραφρενίτις; from παρα, dim. and φρενι, the mind). Diaphragmitis. An inflammation of the diaphragm. A genus of disease in the class pyrexiae and order phlegmasiae of Cullen, known by delirium, with difficulty of breathing, and pain in the region of the diaphragm.

PARAPLEGIA. (*paraplegia*, παραπληγία; from παραπλησσω, to strike inharmoniously.)

Palsy of one half of the body taken transversely. A species of paralysis. See **PARALYSIS**.

PARASANG, an ancient Persian measure, different at different times, and in different places; being usually 30, sometimes 40, and sometimes 50 stadia or furlongs. The word, according to Littleton, has its rise from *parasch angarius*, *q. d.* the space a postman rides from one station, *angarius*, to another.

PARASCENIUM, in the Grecian and Roman theatres, was a place behind the scenes whither the actors withdrew to dress and undress themselves. The Romans more frequently called it *Postscenium*. See **THEATRE**.

PARASELENE, in natural philosophy, a mock moon; a meteor or phenomenon encompassing or adjacent to the moon, in form of a luminous ring; wherein are observed sometimes one and sometimes two or more images of the moon.

PARASEMON, among the Greeks, was the figure carved on the prow of the ships to distinguish them from each other.

PARASITE. *s.* (*parasite*, Fr. *parasita*, Lat.) One that frequents rich tables, and earns his welcome by flattery (*Bacon*).

PARASITICAL. **PARASITIC.** *a.* (from *parasite*.) Flattering; wheedling (*Hak.*).

PARASITIC. In zoology. Animals, &c. are so termed, that receive their nourishment in the bodies of others, as worms, polypes, hydatids, &c.

PARASITIC STEM, in botany. *Parasitica planta*, or plant. *Alteri plantæ nec terræ innatus*. Growing on some other plant, not on the ground.—As *epidendrum*, *tillandsia*.

PARASOL. *s.* A small canopy or umbrella carried over the head, to shelter from the heat of the sun.

PARASTATA, in ancient architecture, a kind of pier, or piedroit, serving as a defence or support to a column or arch.

Mr. Evelyn makes the *parastata* the same with *pilaster*. *Barbaro*, and others, the same with *anta*; and *Daviler*, the same with *piedroit*. See **PILASTER**.

PARASTATÆ, in anatomy. See **PROSTATE**.

PARATHENAR. (παράθηναρ; from παρα, near, and θέναι, the sole of the foot). A muscle situated near the sole of the foot.

PARATHENAR MINOR. See **FLEXOR BREVIS MINIMI DIGITI PEDIS**.

PARATILMUS, in the ancient Greek jurisprudence, a name given to a sort of punishment imposed on adulterers who were poor, and unable to stand the common penalty.

It consisted either in making them run a horse-radish up the anus, which they called *απορραπανιδωσις*; or in tearing up by the roots the hair about the pudenda, which they called *παροστιλμωσις*, of *παροστιλμην*, to tear, pluck up.

PARAZONIUM, παραζώνιον, or *Scipio*, among medalists, a sceptre, rounded at the two ends in manner of a truncheon, or commander's staff; or a kind of poniard, or short sword, represented as worn at the girdle, on several ancient medals.

Antiquaries are much divided on the explanation of the parazonium; as, indeed, the form and manner of bearing it are very different. It is sometimes thrown across the shoulders in manner of a quiver.

To PARBOIL. *v. a.* (*parbouiller*, French.) To half boil; to boil in part (*Bacon*).

To PARBREAK. *v. n.* (*brecker*, Dutch.) To vomit; obsolete.

PARBREAK. *s.* (from the verb.) Vomit (*Spenser*).

PARBUNCLE, in a ship, the name of a rope almost like a pair of slings; it is seized both ends together, and then put almost double about any heavy thing that is to be hoisted in or out of the ship; having the hook of the runner hitched into it, to hoist it up by.

PARCÆ, in mythology, powerful goddesses who presided over the birth and the life of mankind. They were three in number, Clotho, Lachesis, and Atropos, daughters of Nox and Erebus, according to Hesiod, or of Jupiter and Themis, according to the same poet in another poem. Some make them daughters of the sea. Clotho, the youngest of the sisters, presided over the moment in which we are born, and held a distaff in her hand. Lachesis spun out all the events and actions of our life, and Atropos, the eldest of the three, cut the thread of human life with a pair of scissors. The power of the Parcæ was great and extensive. Some suppose that they were subjected to none of the gods but Jupiter, whilst others support that even Jupiter himself was obedient to their commands. According to the more received opinions, they were the arbiters of the life and death of mankind, and whatever good or evil befalls us in the world immediately proceeds from the Fates or Parcæ. The worship of the Parcæ was well established in some cities in Greece, and though mankind knew they were inexorable, yet they were eager to raise to them temples and statues. They received the same worship as the Furies, and their votaries yearly sacrificed to them black sheep. The Parcæ were generally represented as three old women, with chaplets made of wool, and interwoven with the flowers of Narcissus. One of them held a distaff, another the spindle, and the third was armed with scissors, with which she cut the thread which her sisters had spun. Their dress is differently represented by some authors. Hyginus and others call them the secretaries of heaven, and the keepers of the archives of eternity.

PARCEL. *s.* (*parcelle*, Fr. *particula*, Lat.) 1. A small bundle. 2. A part of the whole; part taken separately (*Arbutnot*). 3. A quantity or mass (*Newton*). 4. A number of persons: in contempt (*Shakspeare*). 5. Any number or quantity: in contempt.

To PARCEL. *v. a.* (from the noun.) 1. To divide into portions (*South*). 2. To make up into a mass (*Shakspeare*).

PARCEL-MAKERS, two officers in the exchequer, who make parcels of the escheator's accounts, in which they charge them with

every thing they have levied for the king's use, within the time of their office, and deliver the same to one of the auditors of the court, to make their accounts therewith.

PARCENERS, in law, persons holding lands in copartnership, and who may be compelled to make division. It occurs where lands descend to the females, who all take equal shares of their deceased father's lands.

PARCENERY. *s.* (from *parsonier*, Fr.) A holding or occupying of land by joint tenants, called coparceners (*Cowel*).

To PARCH. *v. a.* To burn slightly and superficially; to scorch; to dry up (*Shakspeare*).

To PARCH. *v. n.* To be scorched (*Shakspeare*).

PARCHMENT, in commerce, the skins of sheep or goats, prepared after such a manner as to render it proper for writing upon, covering books, &c. The manufacture of parchment is begun by the skinner, and finished by the parchment-maker. The skin, having been stripped of its wool, and placed in the lime-pit, in the manner described under the article SHAMMY, the skinner stretches it on a kind of frame, and pares off the flesh, with an iron instrument; this done, it is moistened with a rag, and powdered chalk being spread over it, the skinner takes a large pumice-stone, flat at bottom, and rubs over the skin, and thus scowers off the flesh; he then goes over it again with the iron instrument, moistens it as before, and rubs it again with the pumice-stone without any chalk underneath: this smooths and softens the flesh-side very considerably. He then drains it again, by passing over it the iron instrument as before. The flesh-side being thus drained, by scraping off the moisture, he in the same manner passes the iron over the wool or hair side: then stretches it tight on a frame, and scrapes the flesh-side again: this finishes its draining; and the more it is drained, the whiter it becomes. The skinner now throws on more chalk, sweeping it over with a piece of lamb-skin that has the wool on, and this smooths it still further. It is now left to dry, and when dried, taken off the frame by cutting it all round. The skin, thus far prepared by the skinner, is taken out of his hands by the parchment-maker, who first, while it is dry, pares it on a summer, (which is a calf-skin stretched in a frame) with a sharper instrument than that used by the skinner, and working with the arm from the top to the bottom of the skin, takes away about one half of its thickness. The skin thus equally pared on the flesh-side, is again rendered smooth, by being rubbed with the pumice-stone, on a bench covered with a sack stuffed with flocks, which leaves the parchment in a condition fit for writing upon. The parings thus taken off the leather are used in making glue, size, &c. (See GLUE, &c.) What is called vellum is only parchment made of the skins of abortives, or, at least, sucking calves. This has a much finer grain, and is whiter and smoother than parchment.

but is prepared in the same manner, except its not being passed through the lime-pit.

PARCIEUX, (Anthony de,) a French mathematician. He acquired reputation by his publications, as well as by his lectures, and died universally regretted, 1768. His works are a treatise of trigonometry, 4to.—essays on the probability of the duration of human life, 4to. &c. His nephew, of the same name, was, in 1779, professor of experimental philosophy in the military college of Brienne, and afterwards at the Lyceum at Paris. He was author of Orozio, a tragedy, written when young, and an elementary book on geometrical and astronomical calculations, &c. He died at Paris, 1798.

PARDALIS, in mastiology. See **FE-LIS**.

PARDIES (Ignatius Gaston), an ingenious French mathematician and philosopher, was born at Pau, in the province of Gascony, in 1636; his father being a counsellor of the parliament of that city. At the age of 16 he entered into the order of Jesuits, and made so great a proficiency in his studies, that he taught polite literature, and composed many pieces in prose and verse with a distinguished delicacy of thought and style, before he was well arrived at the age of manhood. Propriety and elegance of language appear to have been his first pursuits; for which purpose he studied the belles lettres, and other learned productions. But afterwards he devoted himself to mathematical and philosophical studies, and read, with due attention, the most valuable authors, ancient and modern, in those sciences: so that in a short time he made himself master of the Peripatetic and Cartesian philosophy, and taught them both with great reputation. Notwithstanding he embraced Cartesianism, yet he affected to be rather an inventor in philosophy himself. In this spirit he sometimes advanced very bold opinions in natural philosophy, which met with opposers, who charged him with starting absurdities: but he was ingenious enough to give his notions a plausible turn, so as to clear them seemingly from contradictions. His reputation procured him a call to Paris, as professor of rhetoric in the college of Lewis the Great. He also taught the mathematics in that city, as he had before done in other places. He had from his youth a happy genius for that science, and made a great progress in it; and the glory which his writings acquired him raised the highest expectations from his future labours; but these were all blasted by his early death in 1673, at 37 years of age; falling a victim to his zeal, he having caught a contagious disorder by preaching to the prisoners in the Bicetre.

PARDIES wrote with great neatness and elegance. His principal works are as follow:

1. *Horologium Thaumaticum duplex*; 1662, in 4to.
2. *Dissertatio de Motu et Natura Cometa-rum*; 1665, 8vo.

3. *Discours du Mouvement Local*; 1670, 12mo.

4. *Elemens de Geometrie*; 1670, 12mo. This has been translated into several languages; in English by Dr. Harris in 1711.

5. *Discours de la Connoissance des Betes*; 1672, 12mo.

6. *Lettre d'un Philosophe à un Cartesien de ses amis*; 1672, 12mo.

7. *La Statique ou la Science des Forces Mouvantes*; 1673, 12mo.

8. *Description et Explication de deux Machines propres à faire des Cadrans avec une grande facilité*; 1673, 12mo.

9. *Remarques du Mouvement de la Lumiere*.

10. *Globi Cœlestis in tabula plana redacti Descriptio*; 1675, folio.

Part of his works were printed together, at the Hague, 1691, in 12mo; and again at Lyons, 1725.—Pardies had a dispute also with sir Isaac Newton, about his New Theory of Light and Colours, in 1672. His letters are inserted in the Philosophical Transactions for that year. (*Hutton's Dictionary*).

TO PARDON. *v. a.* (*pardonner*, French.)

1. To excuse an offender (*Dryden*). 2. To forgive a crime (*Dryden*). 3. To remit a penalty (*Shakspeare*). 4. *Pardon me*, is a phrase of civil denial, or slight apology (*Shakspeare*).

PARDON. *s.* (*pardon*, French.) 1. Forgiveness of an offender. 2. Forgiveness of a crime (*Milton*). 3. Remission of penalty. 4. Forgiveness received (*South*). 5. Warrant of forgiveness, or exemption from punishment (*Shakspeare*).

PARDON, is the remitting or forgiving a felony or other offence committed against the king. Blackstone mentions the power of pardoning offences to be one of the greatest advantages of monarchy, in general, above every other form of government, and which cannot subsist in democracies. Its utility and necessity are defended by him on all those principles which do honour to human nature.

Pardons are either general or special: general, as by act of parliament, of which, if they are without exceptions, the court must take notice, *ex officio*; but if there are exceptions therein, the party must aver, that he is none of the persons excepted: special pardons, are either of course, as to persons convicted of manslaughter, or *se defendendo*, and by several statutes, to those who shall discover their accomplices in several felonies; or of grace, which are by the king's charter, of which the court cannot take notice, *ex officio*, but they must be pleaded. A pardon may be conditional, that is, the king may extend his mercy upon what terms he pleases; and may annex to his bounty a condition, either precedent or subsequent, on the performance whereof the validity of the pardon will depend; and this by the common law.

All pardons must be under the great seal. The effect of a pardon is to make the offender a new man; to acquit him of all corporal pe-

nalties and forfeitures annexed to that offence, and to give him a new credit and capacity; but nothing but an act of parliament can restore or purify the blood after an attainer.

PARDONABLE. *a.* (*pardonable*, Fr.) Venial; excusable (*Dryden*).

PARDONABLENESS. *s.* (from *pardonable*.) Venialness; susceptibility of pardon.

PARDONABLY. *ad.* (from *pardonable*.) Venially; excusably (*Dryden*).

PARDONER. *s.* (from *pardon*.) 1. One who forgives another (*Shakspeare*). 2. A fellow that carried about the pope's indulgences, and sold them to such as would buy them (*Conell*).

PARDUBITZ, a town of Bohemia, in the circle of Chrudin, with a fortified castle. It has a manufacture of knives and sword-blades, and stands on the Elbe, 43 miles E. by S. of Prague. Lon. 15. 41 E. Lat. 49. 58 N.

To PARE. *v. a.* To cut off extremities of the surface; to cut away by little and little; to diminish (*Hooker*).

PARE (Ambrose), an eminent surgeon, born at Laval. Though a protestant, he was surgeon to Henry II. of France, and to his successors; and at the massacre of St. Bartholomew, Charles IX. saved his life by shutting him up in his own closet. He made some useful discoveries in anatomy, and died 1590, at an advanced age. His works were translated into Latin by Guillemeau.

PARE (David), a protestant divine, born 1548, in Silesia. His step-mother placed him with an apothecary, and afterwards with a shoemaker; but his father recovering to a sense of his duty, permitted him to cultivate literature. By the advice of his master he exchanged his name of Wangler for the Greek word Pareus, and he became theological professor at Heidelberg. The best part of his life was engaged in controversy, in which he displayed learning and moderation. He died 1622, in his pareanum, in the suburbs of Heidelberg. Besides some tracts against the pope, and Bellarmine, he published a commentary on St. Paul's epistle to the Romans, which was condemned by the university of Oxford, and burnt publicly by order of James I.

PARE (Philip), son to the above, was a grammarian, born at Hembach, 1576. He was rector of the college of Neustadt, and afterwards of Hanau, and died 1650. He wrote *Lexicon Criticum*, 8vo; *Lexicon Plautinum*, or a Vocabulary of Plautus' Comedies; *Galligraphia Romana*, 8vo. &c.

PAREGORICS. (*medicamento paregorica*, *παρεγορικὰ*; from *παρεγορεω*, to mitigate, to assuage.) Medicines that allay pain.

PARENCHYMA. (*παρεγχυμα*; from *παρεχω*, to strain through, because the ancients believed the blood was strained through it.) In anatomy, the spongy and cellular substance that connects parts together. It is now only, in anatomy, applied to the connecting medium of the substance of the lungs.

PARENCHYMA, in botany, the fleshy sub-

stance which lies within the cellular membrane, and surrounds the medulla or pith of plants, and is said to be the chief seat of vegetable irritability. See Willdenow, p. 241.

PARENT, a term of relation applied to those persons from whom we derive our temporal existence.

The moral duties of parents towards their offspring, being a subject too extensive for our plan, we shall not enter into any ethical inquiry, but confine our attention to their legal duties; that is, such as they owe to their legitimate children, respecting their maintenance, education, and protection.

1. With regard to their maintenance, it is a principle both of law and nature, that every man is bound to provide for his offspring. The father and mother, and also the grandsire and grandmother of feeble and poor descendants, are obliged by the 43 Eliz. c. 2, to support them at their own expence (provided they be able), in such manner as shall be directed by the quarter-sessions; and, if a man abscond, and desert his children, the 5 Geo. I. c. 8, directs the churchwardens and overseers of his parish to seize his property, and dispose of it for their relief. Thus, it has been wisely established by these statutes, that if a mother or grandmother, who formerly was able to maintain the child, marry a second time, the step-father becomes chargeable with its maintenance; for, being their debt when single, it extends in common with all others to charge, the second husband; but, as the death of the wife dissolves the relation, such duty then ceases to bind him. No person, however, is compellable to support his issue, excepting the latter be incapacitated from labour by infancy, disease, or accident; in which cases the former is obliged to provide them with necessaries, on penalty of paying 20s. per month to the parish, in case of refusal.

Farther, the law of England does not prevent a man from disinheriting his children by will; but, in conformity to the custom of London, the offspring of freemen are entitled to one-third part of their father's effects, which must be equally divided among them, and of which they cannot be deprived. Hence, too, heirs and children are peculiarly protected by courts of justice; lest they should be disinherited by any ambiguous or uncertain expressions; because it is necessary to prove, beyond the possibility of doubt, the testator's intention to deprive them of their right of inheritance.

2. The most important duty of parents is that of educating their children, in a manner becoming their rank in life. And, though it must be confessed that the law of England is deficient in this respect, yet it has also provided for the welfare of the rising generation; as, by the statutes for the apprenticing of poor children, these are to be taken from their parents, and placed by the churchwardens of the parish in such situations, as may render them most useful to the commonwealth.

3. The last duty of parents towards their offspring is protection, which may be considered principally as a natural obligation; no municipal laws enjoining its observance. But, though a child be thus placed in the power of its parent, the latter cannot abuse such authority. He may exercise proper severity to keep his children in due obedience: thus, he may lawfully, and in a reasonable manner, chastise them; because such correction is sometimes necessary, and conducive to their improvement. This authority of the parent, however, extends only to the end of the child's minority, during which period the former is entitled to the benefit of the labour and assistance thus obtained, while the latter resides with, and is maintained by him: a parent may likewise allow or forbid the marriage of his children, till they attain the age of twenty-one years. Now, the legal power of the progenitor ceases; because the adults are enfranchised by arriving at years of discretion, when the empire of the father, or of the guardian, is supposed to yield to that of reason.

PARENT (Anthony), a respectable French mathematician, was born at Paris in 1666. He showed an early propensity to the mathematics, eagerly perusing such books in that science as fell in his way. His custom was to write remarks in the margins of the books he read; and in this way he had filled a number of books with a kind of commentary by the time he was thirteen years of age.

Soon after this he was put under a master, who taught rhetoric at Chartres. Here he happened to see a dodecahedron, upon every face of which was delineated a sun-dial, except the lowest on which it stood. Struck as it were instantaneously with the curiosity of these dials, he attempted drawing one himself: but having only a book which taught the practical part, without the theory, it was not till after his master came to explain the doctrine of the sphere to him, that he began to understand how the projection of the circles of the sphere formed sun-dials. He then undertook to write a treatise upon gnomonics. To be sure the piece was rude and unpolished enough; however, it was entirely his own, and not borrowed. About the same time he wrote a book of geometry, in the same taste, at Beauvais.

His friends then sent for him to Paris to study the law; and in obedience to them he went through a course in that faculty: which was no sooner finished, than, urged by his passion for mathematics, he shut himself up in the college of Dormans, that no avocation might take him from his beloved study: and, with an allowance of less than 200 livres a year, he lived content in this retreat, from which he never stirred but to the Royal College, in order to hear the lectures of M. de la Hire or M. de Sauveur. When he found himself capable of teaching others, he took pupils: and fortification being a branch of mathematics which the war had brought into particular notice, he turned his attention to it;

but after some time began to entertain scruples about teaching what he had never seen, and knew only by the force of imagination. He imparted this scruple to M. Sauveur, who recommended him to the marquis d'Aligre, who luckily at that time wanted to have a mathematician with him. Parent made two campaigns with the marquis, by which he instructed himself sufficiently in viewing fortified places; of which he drew a number of plans, though he had never learned the art of drawing. From this period he spent his time in a continual application to the study of natural philosophy, and mathematics in all its branches, both speculative and practical; to which he joined anatomy, botany, and chemistry. His genius managed every thing, and yet he was incessant and indefatigable in his application. M. de Billetes, who was admitted in the academy of sciences at Paris, in 1699, with the title of their mechanician, nominated for his disciple Parent, who excelled chiefly in this branch. It was soon discovered in this society, that he engaged in all the various subjects which were brought before them; and indeed that he had a hand in every thing. But this extent of knowledge, joined to a natural impetuosity of temper, raised in him a spirit of contradiction, which he indulged on all occasions; sometimes to a degree of precipitancy highly culpable, and often with but little regard to decency. Indeed the same behaviour was shown to him, and the papers which he brought to the academy were often treated with much severity. He was charged with obscurity in his productions; and he was indeed so notorious for this fault, that he perceived it himself, and could not avoid correcting it. The king had, by a regulation in 1716, suppressed the class of scholars of the academy, which seemed to put too great an inequality betwixt the members. Parent was made a joint or assistant member for geometry: but he enjoyed this promotion but a short time; for he was taken off by the small-pox the same year, at the age of 50. He was author of a great many pieces, chiefly on mechanics and geometry.

PA'RENTAGE. *s.* (from *parent*.) Extraction; birth; condition with respect to the rank of parents (*Shakspeare*).

PARENTAL. *a.* (from *parent*.) Becoming parents; pertaining to parents (*Brown*).

PARENTA'TION. *s.* (from *parento*, Lat.) Something done or said in honour of the dead.

PARENTHESIS. *s.* (*parenthese*, French. *παρεσβ*, *εσ* and *παραρτησις*.) A sentence so included in another sentence, as that it may be taken out without injuring the sense of that which encloses it: commonly marked thus () (*Watts*).

PARENTHETICAL. *a.* (from *parenthese*.) Pertaining to a parenthesis.

PARENZA, a seaport of Istria, on a peninsula in the gulf of Venice, with a harbour for large vessels. It is 28 miles S. by W. of Capo d'Istria. Lon. 13. 50 E. Lat. 45. 18 N.

PARER. *s.* (from *pare*.) An instrument to cut away the surface (*Tusser*).

PARERGY. *s.* (*παρά and εργον*.) Something unimportant; something done by the by (*Brown*).

PAREISIS. (*παρεΐσις*; from *παύωμαι*, to relax.) An imperfect palsy.

PARGET. *s.* Plaster laid upon roofs of rooms (*Woodward*).

TO PARGET. *v. a.* (from the noun.) To plaster; to cover with plaster (*G. of Tongue*).

PARGETING, in building, is used for the plastering of walls, and sometimes for plaster itself. Pargeting is of various kinds: as, 1. White-lime and hair-mortar laid on bare walls. 2. On bare laths, as in partitioning and plain ceiling. 3. Rendering the insides of walls, or doubling partition walls. 4. Rough-casting on heart-laths. 5. Plastering on brick-work, with finishing mortar, in imitation of stone-work; and the like upon heart-laths.

PARHELION, or **PARHELUM**. (formed from *παρα*, near, and *ήλιος*, sun.) In natural philosophy, a mock-sun or meteor, in form of a very bright light appearing on one side of the sun. Appearances of this kind have been made mention of both by the ancients and moderns. Aristotle observes, that in general they are seen only when the sun is near the horizon, though he takes notice of two that were seen in Bosphorus from morning to evening; and Pliny has related the times when such phenomena were observed at Rome. Gassendi says, that in 1635 and 1636, he often saw one mock-sun. Two were observed by M. de la Hire in 1689; and the same number by Cassini in 1693, Mr. Grey in 1700, and Dr. Halley in 1702: but the most celebrated appearances of this kind were seen at Rome by Scheiner, by Muschenbroeck at Utrecht, and by Hevelius at Sedan. By the two former, four mock-suns were observed, and by the latter seven.

Parhelia are apparently of the same size with the sun, though not always of the same brightness, nor even of the same shape; and when a number appear at once, there is some difference in both these respects among them. Externally they are tinged with colours like the rainbow; and many have a long fiery tail opposite to the sun, but paler towards the extremity. Parhelia are generally accompanied with coronas, some of which are tinged with rainbow colours, but others are white. They differ in number and size; but all agree in breadth, which is that of the apparent diameter of the sun.

A very large white circle, parallel to the horizon, generally passes through all the parhelia; and, if it were entire, it would go through the centre of the sun. Sometimes there are arcs of lesser circles concentric to this, touching those coloured circles which surround the sun. They are also tinged with colours, and contain other parhelia. There are also said to have been other circles obliquely situated with respect to all those we have mentioned: but of this we have met with no authentic account.

The order of the colours in these circles is the same as in the rainbow; but on the inside, with respect to the sun, they are red, as is also observed in many other coronas.

Dr. Thomas Young has recently proposed a new theory of both halos and parhelia, as follows:

The explanation of the primary and secondary rainbow, begun by de Dominis, and completed by Descartes and Newton, derives an entire and satisfactory confirmation from the perfect coincidence of the observed angular magnitudes, with the result of calculations of the effect of spherical drops. We know that drops of water, either accurately, or very nearly spherical, exist in great abundance in every cloud, and in every shower of rain; and whatever their dimensions may be, they must necessarily conspire in the same general effect of producing the same rainbow, whenever a spectator is placed in a proper situation for observing it; consequently such rainbows are of very frequent occurrence.

Dr. Young has attempted to show, that for producing the phenomena of variable halos, often observable in hot climates, it is only necessary that a considerable part of the spherules of a cloud or mist be either accurately, or very nearly, of equal magnitude, a condition, of which the possibility is easily admitted from analogy, and the probability is favoured by the apparent uniformity of the different parts of such mists as we can examine.

But no satisfactory reason has hitherto been assigned for the production of the halo, which in these climates is the most common of all; that is, the constant halo of 23° or 24°. The hypothesis by which Huygens attempted to explain the production of halos and parhelia, are both arbitrary and improbable. He imagined the existence of particles of hail, some globular, others cylindrical, with an opaque part in the middle of each, bearing a certain ratio to the whole; and he supposed the position of the cylinders to be sometimes vertical, and sometimes inclined to the horizon in a given angle.

It has already been objected, that no such particles have ever been observed to accompany halos; and it is, besides, highly improbable, that such an opaque part should bear the same proportion in all the hailstones, and that the cylinders should have terminations so peculiar as is supposed; and the most incredible circumstance of all is, that all these proportions should be constantly such, as always to produce a halo at the distance of 23° or 24° from the sun or moon.

It appears that a much simpler and more natural explanation of these phenomena may be deduced from the regular crystallization of snow in the atmosphere.

It is well known, that the crystals of ice and snow tend always to form angles of 60°; now a prism of water or ice, of 60°, produces a deviation of 23° 37', for rays forming equal angles with its surfaces, and the angle of deviation varies at first very slowly, as the inclination

changes, the variation amounting to less than 3° , while the inclination changes 30° .

Now if such prisms were placed at all possible angles of inclination, differing equally from each other, one half of them would be so situated, as to be incapable of transmitting any light regularly by two successive refractions directed the same way; and of the remaining two-fourths, the one would refract all the light within these three degrees, and the other would disperse the light in a space of between 20° and 30° beyond them.

In the same manner we may imagine an immense number of prismatic particles of snow to be disposed in all possible directions, and a considerable proportion of them to be so situated, that the plane of their transverse section may pass within certain limits of the sun and the spectator. Then half of these only will appear illuminated, and the greater part of the light will be transmitted by such as are situated at an angular distance of $23^\circ 37'$, or within 3° of it: the limit being strongly marked internally, but the light being externally more gradually lost. And this is precisely the appearance of the most common halo. When there is a sufficient quantity of the prismatic particles, a considerable part of the light must fall, after one refraction, on a second particle; so that the effect will be doubled: and, in this case, the angle of refraction will become sufficient to present a faint appearance of colour, the red being internal, as the least refrangible light, and the external part having a tinge of blue.

These concentric halos of 231° and 47° are therefore sufficiently explicable, by particles of snow, situated promiscuously in all possible directions. If the prisms be so short as to form triangular plates, these plates, in falling through the air, will tend to assume a vertical direction, and a much greater number of them will be in this situation than in any other. The reflection from their flat surfaces will consequently produce a horizontal circle of equal height with the sun; and their refraction will exhibit a bright parhelion immediately over the sun, with an appearance of wings, or horns, diverging upwards from the parhelion.

For all such particles as are directed nearly towards the spectator, will conspire in transmitting the light much more copiously than it can arrive from any other part of the circle; but such as are turned more obliquely will produce a greater deviation in the light, and at the same time a deflection from the original vertical plane. This may be easily understood, by looking at a long line through a prism, held parallel to it: the line appears, instead of a right line, to become a curve, the deviation being greater in those rays that pass obliquely with respect to the axis of the prism; which are also deflected from the plane in which they were passing.

The line viewed through the prism has no point of contrary flexure, but if its ordinates

were referred to a centre, as in the case of the halos, it would assume a form similar to that which parhelia frequently assume.

The form of the flakes of snow as they usually fall is indeed more complicated than we have been supposing, but their elements in the upper regions of the air are probably more simple. The coincidence in the magnitude of the observed and calculated angles is so striking, as to be nearly decisive with respect to halos, and it is not difficult to imagine that many circumstances may exist, which may cause the axis of the greater number of the prisms to assume a position nearly horizontal, which is all that is required for the explanation of the parhelia with their curved appendages. Perhaps also, the effect may sometimes be facilitated by the partial melting of the snow into conoidal drops: for it may be shown, by the light of a candle transmitted through a wine glass full of water, that such a form is accommodated to the production of an inverted arch of light, like that which is frequently observed to accompany a parhelion.

PARIA, or **NEW ANDALUSIA**, a province of Terra Firma, in the government of Caraccas, lying to the S.E. of Cumana, on the banks of the Oronoko, and including the delta of the river. On the N. of this province, between Cumana and the island of Trinidad, is a large bay called the Gulf of Paria.

PARIAN CHRONICLE. See **ARUNDelian MARBLES**.

PARIANA. In botany, a genus of the class monœcia, order polyandria. Male: flowers in whorls, forming spikes; calyx two-valved; corol two-valved, larger than the calyx; stigmas two; seeds three-sided, inclosed. One species: a Cayenne plant.

PARIAS, or **PERREAS**, a tribe of Hindus, so peculiarly distinguished from all others, that they live by themselves in the out-skirts of towns; and, in the country build their houses apart from the villages, or rather have villages of their own, furnished with wells; for they dare not so much as fetch water from those which other families make use of; and, lest these latter should inadvertently go to one of theirs, they are obliged to scatter the bones of dead cattle about their wells, that they may be known. They dare not in cities pass through the streets where the Bramins live; nor set foot in the villages where they dwell. They are likewise forbidden to enter a temple, either of their god Wistnow or Eswara; because they are held impure. They get their bread by sowing, digging, and building the walls of mud-houses; most of those inhabited by the common people being raised by these Parias, who also do such kinds of dirty work as other people do not care to meddle with. Nor is their diet much more cleanly.

PARIERA BRAVA. (*pariera*, Span.) The root of this plant, *cissampelos pareira*, *foliis pellatis cordatis emarginatis* of Linnæus. C. O. Dioclea. Monadelphia. A native of South America and the West Indies, has no

remarkable smell, but to the taste it manifests a notable sweetness of the liquorice kind, together with a considerable bitterness, and a slight roughness covered by the sweet matter. The facts adduced on the utility of the radix *pareiræ* bravæ in nephritic and calculous complaints are principally mentioned by foreigners, and no remarkable instances of its efficacy are recorded by English practitioners.

PARIETAL BONES. (*parietalis*, from *paries*, a wall, because they defend the brain like walls.) *Ossa verticis*. *Ossa sincipitis*. *Ossa verticalia vel bregmatis*. Two arched and somewhat quadrangular bones, situated one on each side of the superior part of the cranium. Each of these bones forms an irregular square. They are thicker above than below; but are somewhat thinner, and at the same time more equal and smooth than the other bones of the cranium. The only foramen we observe in them is a small one towards the upper and posterior part of each. It has been named the parietal foramen, and serves for the transmission of a small vein to the longitudinal sinus. In many subjects this foramen is wanting. On the inner surface of these bones are the marks of the vessels of the dura mater, and of the convoluted surface of the brain. On the inside of their upper edge we may likewise observe a considerable furrow, which corresponds with the longitudinal sinus of the dura mater; and lower down, towards their posterior and inferior angle, is a smaller one for part of the lateral sinuses. These bones are joined to each other by the sagittal suture; to the *os sphenoides*, and *os temporum*, by the squamous suture; to the *os occipitis* by the lambdoidal suture; and to the *os frontis* by the coronal suture. Their connection with this latter bone is well worthy our attention. We shall find, that in the middle of the suture, where the *os frontis*, from its size and flatness, is the most in danger of being injured, it rests upon the arch formed by the parietal bones; whereas at the sides, the parietal bones are found resting upon the *os frontis*, because this same arch is there in the greatest danger from pressure. In new-born infants, the *ossa parietalia* are separated from the middle of the divided *os frontis* by a portion of the cranium, then unossified. When the finger is applied to this part, the motion of the brain, and the pulsation of the arteries of the dura mater, may be easily distinguished. In general, the whole of this part is completely ossified before we are seven years of age.

PARIETARIA. Pellitory. In botany, a genus of the class polygamia, order monoecia. Herm.: calyx four-cleft; stamens four; style one; seed one, superior, covered with the elongated calyx. Fem.: stamenless. Ten species; chiefly of the Cape, India, and south of Europe: one, *P. officinalis*, common to the walls of our own country.

The only cultivated species is *P. arboreum*, tree pellitory, a soft upright shrub of a man's height, with red shoots, villose with hoary

hairs; flowers commonly three, clustered, from the axil of each bracte, sessile; in the male yellow, in the female red, herbaceous. A native of the Canaries.

PARING. *s.* (from *pare*.) That which is pared off any thing; the rind (*Pope*).

PARING, in farriery, an operation performed on a horse's foot with a view to adapt it to the shoe. This is done with a butteris, and frequently to the great prejudice of the foot. The original design of shoeing horses was undoubtedly intended as a preservation of the hoof, and a defence of the sole; but no one could think it necessary to pare away what he wanted to preserve by the use of shoes, because that would be to act contrary to his first principles, and destroy his own work. This preparation should never be permitted, but in cases where the horny sole is uneven, insomuch that the shoe will not otherwise bear equally upon the foot, which would take off from its necessary firmness. In such a case, perhaps, it may be reasonable, otherwise it must be very absurd and injurious. The farrier usually holds the horse's foot between his knees, in which posture he pares the foot, sets on the shoe, drives the nails, and rivets them; and all this without any assistance.

PARING, in husbandry, a particular process for clearing the soil of weeds and rendering it more productive. See **HUSBANDRY**.

PARIS, the son of Priam, king of Troy, by Hecuba, also called Alexander, was destined, even before his birth, to become the ruin of his country. When his mother, in her pregnancy, had dreamed she should bring forth a torch, which would set fire to her palace, the soothsayers foretold her offspring would prove the destruction of Troy. Priam, to prevent so great an evil, ordered his slave Archelaus to destroy the child as soon as born. The slave, touched with humanity, did not destroy him, but exposed him on mount Ida, where the shepherds found him, and educated him as their own. Paris, though educated among shepherds, gave early proofs of courage, and from his care in protecting the flocks of mount Ida against the wild beasts, he obtained the name of Alexander (helper or defender). Here he gained the favour of Cœnone, a nymph of Ida, whom he married, but their conjugal peace was soon disturbed. At the marriage of Peleus and Thetis, the goddess of discord, not being invited to the entertainment, showed her displeasure, by throwing among the gods; at the celebration of the nuptials, a golden apple, on which were written the words *Detur pulchriori*. All the goddesses claimed it as their own, but Juno, Venus, and Minerva, only wished to dispute the right to the apple. The gods then appointed Paris to adjudge the prize of beauty to the fairest of the goddesses. The goddesses appeared before their judge without any ornament, and each tried by promises, &c. to influence his judgment. Juno promised him a kingdom; Minerva, military glory; and Venus, the fairest woman in the

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world for his wife. Paris at length adjudged the prize to Venus. This decision of Paris in favour of Venus drew upon the judge and his family the resentment of the two other goddesses. From some subsequent circumstances, the birth and the manner of preservation of Paris were discovered, and Priam finally acknowledged him as his son, forgetful of the alarming dreams which had influenced him to meditate his death. Paris then equipped a fleet, as if willing to redeem Hesione, whom Hercules had carried away and obliged to marry Telamon. This was the pretended motive of his voyage. He recollected that he was to have Helen, the fairest woman of the age, whom Venus had promised him. On these grounds he visited Sparta, the residence of Helen, who had married Menelaus, and was received kindly, but he abused the hospitality of Menelaus, and while he was absent in Crete, Paris carried off Helen, and Priam received her into his palace. This affair was soon productive of serious consequences. When Menelaus had married Helen, all her suitors had bound themselves by a solemn oath to defend her from every violence (see HELENA), and therefore her husband reminded them of their engagements. Upon this, all Greece took up arms. Agamemnon was chosen general of the combined forces, and a regular war was begun. (See TROJA.) Paris, meanwhile, armed himself with his brothers to oppose the enemy. He fought with little courage, and at the sight of Menelaus he retired from the front of the army. In a combat with Menelaus, he must have perished, had not Venus stolen him from the resentment of his adversary. He nevertheless wounded in another battle Machaon, Euripilus, and Diomedes, and according to some, killed the great Achilles. (See ACHILLES.) The death of Paris is differently related. Some say he died by one of the arrows of Philoctetes, which had been once in the possession of Hercules.

PARIS (Matthew), one of our best historians from William the Conqueror to the latter end of the reign of Henry III. but of his life few particulars have been transmitted to us. Leland, his original biographer, without determining whether he was born in France or England, informs us, that he was a monk of St. Alban's, and that he was sent by pope Innocent to reform the monks of the convent at Holm in Norway. Bishop Bale, the next in point of time, adds to the above relation, that, on account of his extraordinary gifts of body and mind, he was much esteemed, particularly by king Henry III. who commanded him to write the history of his reign. Fuller makes him a native of Cambridgeshire, because there was an ancient family of his name in that county. He also mentions his being sent by the pope to visit the monks in the diocese of Norwich. Bishop Tanner, bishop Nicholson, doctor du Pin, and the *Nouveau Dictionnaire Historique*, add not a single fact to those above related. Matthew Paris died in the monastery of St. Alban's in the year 1259. He was doubt-

less a man of extraordinary knowledge for the 13th century; of an excellent moral character, and, as an historian, of strict integrity. His style is unpolished; but that defect is sufficiently atoned for by the honest freedom with which he relates the truth, regardless of the dignity or sanctity of the persons concerned. His works are, 1. *Historia ab Adamo ad Conquestum Angliæ*, lib. i. manuscript. col. C. C. Cantab. c. ix. Most of this book is transcribed, by Matthew of Westminster, into the first part of his *Florilegium*. 2. *Historia major, seu rerum Anglicanorum historia a Gul. Conquestoris adventu ad annum 43 Henrici III.* &c. several times printed. The first part of this history, viz. to the year 1235, is transcribed almost verbatim from the Chronicle of Roger Wendover; and the Appendix, from the year 1260, is the work of William Rashington, who was also a monk of St. Alban's. 3. *Vitæ duorum Offarum, Mercie regum, S. Albani fundatorum*. 4. *Gesta 22. addatum S. Albani*. 5. *Addimenta chronicorum ad hist. majorem*; printed. 6. *Historia minor, sive epitome majoris historiæ*; manuscript. Besides many other things in manuscript.

PARIS, a city and the capital of France, the see of an archbishop, and the seat of a university. The river Seine, which crosses it, forms two small islands, called Isle du Palais and Isle Notre Dame; the first is the ancient city of Paris, and had its name from a building which was formerly the residence of the kings, and afterwards resigned to the parliament. Paris has 16 gates, and is 15 miles in circumference, including the suburbs. That part of it which is called the ville is situate to the north, the university to the south, and the city in the centre. The streets are narrow, and generally without accommodation for foot passengers. The houses are built of freestone, many of them seven stories high, and often contain a different family on every floor. The number of inhabitants, by a late official statement, is 546,856. There are nine principal bridges in Paris, but only three of them occupy the whole breadth of the Seine, which is not half so large as the Thames at London. There are a great number of public fountains, and some triumphal arches. Of the squares, the finest is the Place de Louis Quinze, of an octagon form, in which was an equestrian statue, in bronze, of that monarch. This square, now called the Place de la Revolution, was the fatal scene of the execution of Louis XVI. and of his consort Marie Antoinette, and of his sister the princess Elisabeth. Besides the cathedral of Notre Dame, one of the largest in Europe, Paris has many fine churches. The abbey of St. Genevieve was founded by king Clovis, whose monument is still to be seen in the church; it has a library of 24,000 printed books and 2000 manuscripts, also a valuable cabinet of antiquities and natural curiosities. The new church of St. Genevieve (now called the Pantheon) was destined by the national assembly, in 1791, to receive the remains of such great men as had merited well of their country.

The Bastile, built as a fortress by Charles V. lately served for a state prison; but it was destroyed by the people, in the beginning of the revolution. The university, founded by Charles the fat, consists of four faculties; namely, divinity, the civil and canon law, physic, and the sciences: its head is the rector, who is always chosen from the faculty of the sciences. The finest college in Paris is that of the Four Nations, called also Mazarin, from the cardinal, its founder. Among the public libraries, that lately called the royal holds the first rank, in respect both to the extent of the buildings, and the number of volumes. The royal observatory is built of freestone, and neither iron nor wood has been employed in the erection. The botanical garden is worthy of its appellation of royal. The four principal palaces are the Louvre, the Thuilleries, the Palais Royal, and the Luxembourg. In the Louvre is deposited the finest collection of paintings and statues in the world; the principal of them lately brought from various parts of Italy. The garden of the Thuilleries, in front of the palace and on the banks of the Seine, is the finest public walk in Paris. The Palais Royal was long the property of the dukes of Orleans; and the interior courts have been embellished with many beautiful buildings, with shops, coffeehouses, and a garden, which render it like a perpetual fair. The Luxembourg is famous for its gallery, in which are twenty exquisite paintings by Rubens. The Hospital-general, which also goes by the name of la Salpêtrerie (saltpetre being formerly made here), is a most noble foundation for the female sex; near 7000 of whom are here provided for, and live under the inspection of sixty sisters. To this incomparable foundation belongs the castle of Bicestres, defended on all sides by a wall, of considerable circuit, which contains within it many large buildings and several open places; and here near 4000 persons of the other sex are maintained. The Hospital de la Pietie, where poor children are brought up, constitutes also a part of the Hospital-general. These three foundations, with the Hotel Dieu, have one common fund, amounting to full two millions of livres a year. The Hotel des Invalides, for the wounded and superannuated soldiery, built by Lewis XIV. is a magnificent structure; as is the military school in the Champ de Mars, founded by Lewis XV. The two principal theatres are the Theatre de la Nation and the Italian theatre; which, in point of elegance and convenience, are worthy of the capital of a great nation. The Monnoie, or mint, is also a noble building, situate on that side of the Seine, opposite the Louvre. The Samaritan is a beautiful edifice, at the end of the bridge leading to the Louvre, and contains an engine for conveying the water of the Seine to all the parts of the villa. The Hotel de Ville is an ancient structure; this tribunal stands in the Place de Greve, where all public rejoicings are celebrated, and common malefactors executed. The most interesting of the manufactures of Paris is plate-glass, and tapestries made

after the pictures of the greatest masters. In the environs are excellent freestone and abundance of gypsum. Paris now forms, with a small district round it, one of the departments of France. It is 210 miles S.S.E. of London, 625 W. of Vienna, and 630 N.N.E. of Madrid, Lon. 2. 20 E. Lat. 48. 50 N.

PARIS, a town of Kentucky, chief of Bourbon county, situate in a fine plain, watered by a small river, 30 miles E. of Frankfort.

PARIS (Department of), one of the new divisions of France, including the city of Paris, and its immediate environs.

PARIS. Herb-Paris, or true-love. In botany, a genus of the class octandria, order tetragynia. Calyx four-leaved; petals four, narrower than the calyx; berry superior, four-celled; anthers growing to the middle of the filaments. One species: *P. quadrifolia*, indigenous to the woods of our own country. The colour and smell of this plant indicate its possessing narcotic powers. The leaves and berries are said to be efficacious in the cure of hooping cough, and to act like opium. Great caution is requisite in their exhibition, as convulsions and death are caused by an overdose. The root possesses emetic qualities.

PARIS (Plaster of). See PLASTER.

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church, and are under the particular charge of its minister. The word comes from the Latin *parochia*, the Greek *παροικια*, habitation; compound of *παρ*, near, *οικος*, house. Accordingly Du Cange observes, that the name *παροικια* was anciently given to the whole territory of a bishop, and derives it from neighbourhood; because the primitive christians not daring to assemble openly in cities, were forced to meet secretly in neighbour-houses.

In the ancient church there was one large edifice in each city for the people to meet in; and this they called *parochia*, parish. But the signification of the word was afterwards enlarged, and by a parish was meant a diocese, or the extent of the jurisdiction of a bishop, consisting of several churches; unless we will suppose, as somedo, that those bishops were only pastors of single churches. Du Pin observes, that country parishes had not their origin before the 4th century; but those of cities are more ancient. The city of Alexandria is said to have been the first that was divided into parishes.

It seems pretty clear and certain, says judge Blackstone (Com. vol. i. p. 112), that the boundaries of parishes were first ascertained by those of a manor or manors; because it very seldom happens that a manor extends itself over more than one parish, though there are often many manors in one parish. The lords, he adds, as christianity spread, began to build churches upon their own demesnes or wastes, in order to accommodate their tenants in one or two adjoining lordships; and that they might have divine service regularly performed therein, obliged all their tenants to appropriate their tithes to the maintenance of the one officiating

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minister, instead of leaving them at liberty to distribute them among the clergy of the diocese in general; and this tract of land, the tithes of which were so appropriated, formed a distinct parish; and this accounts for the frequent intermixture of parishes one with another. For if a lord had a parcel of land detached from the main of his estate, but not sufficient to form a parish of itself, it was natural for him to endow his newly erected church with the tithes of such lands. Extra parochial wastes and marsh land, when improved and drained, are by 17 Geo. II. cap. 37. to be assessed to all parochial rates in the parish next adjoining. Camden reckons 9284 parishes in England; and Chamberlayne makes 9912. They are now generally reckoned nearly 11,000. See **BENEFICE** and **NON-RESIDENT**.

PARISH-CLERK. In every parish the parson, vicar, &c. hath a parish-clerk under him, who is the lowest officer of the church. These were formerly clerks in orders, and their business at first was to officiate at the altar; for which they had a competent maintenance by offerings; but they are now laymen, and have certain fees with the parson on christenings, marriages, burials, &c. besides wages for their maintenance. The law looks upon them as officers for life: and they are chosen by the minister of the parish, unless there is a custom for the parishioners or church-wardens to choose them; in which case the canon cannot abrogate such custom; and when chosen, it is to be signified, and they are to be sworn into their office by the archdeacon, for which the court of king's bench will grant a mandamus.

PARISH. *a.* 1. Belonging to the parish; having the care of the parish (*Ayliffe*). 2. Maintained by the parish (*Gay*).

PARISHIONER. *s.* (*paroissien*, French, from *parish*.) One that belongs to the parish.

PARISTHMA. (*παριστα*, near, and *ισθμος*, the tonsils and their vicinity.) In medicine, a disease of the tonsils; a quincy.

PARITOR. *s.* (for *apparitor*.) A beadle; a summoner of the courts of civil law (*Dryd.*).

PARITY. *s.* (*parité*, Fr. *paritas*, Latin.) Equality; resemblance (*Hall*).

PARIUM, a noble city of Mysia Minor, with a port on the Propontis; called Adrastia by Homer, according to Pliny; but Strabo distinguishes them: according to others, the Paestos of Homer. Pariani, the people (*Strabo*). The birthplace of Neoptolemus surnamed Glossographus (*Strabo*). Here stood a Cupid equal in exquisite workmanship to the Cnidian Venus.

PARK, an extensive tract of ground, or country, enclosed with wall or paling, well variegated with wood and water, for the support of cattle, and preservation of venison and game. It becomes a park by the privilege of prescription, or by the king's grant. There are many parks in possession of the crown (as well as of opulent individuals), of all which Windsor great park is the largest in the kingdom. It is upon record, that the park of Woodstock was the

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first in England, formed and enclosed about the year 1124, and bounded by a stone wall seven miles in circumference. The example was followed by Henry Earl of Warwick; after which park-making became a common practice in different parts of the country.

To a park three things are required. 1. A grant thereof. 2. Inclosure by pale, wall, or hedge. 3. Beasts of a park; such as the buck, doe, &c. And where all the deer are destroyed, it shall no more be accounted a park; for a park consists of vert, venison, and inclosure; and if it is determined in any of them, it is a total disparking. Parks as well as chases are subject to the common law, and are not to be governed by the forest laws.

PARK LEAVES. In botany. See **HYPERICUM**.

PARK OF ARTILLERY. See **ARTILLERY**.

To PARK. *v. a.* (from the noun.) To enclose as in a park (*Shakspeare*).

PA'RKER. *s.* (from *park*.) A park keeper.

PARKER (Matthew), archbishop of Canterbury, was born at Norwich and educated at Cambridge, being first bible clerk or scholar, and afterwards fellow of Corpus Christi college in that university. He was chaplain to queen Anne Boleyn, who afterwards preferred him to the deanery of Stoke; afterwards he became chaplain to Henry VIII. and Edward VI. He was chosen master of his college to which he was a benefactor. By queen Mary he was deprived of all his preferments. In his retirement he wrote *A Defence of the Marriage of Priests*. On the accession of queen Elizabeth, he was consecrated archbishop of Canterbury. He solicited the queen to remove the crucifixes, lighted tapers, and images out of her own chapel. He improved the English translation of the bible, and had it printed on a larger paper, and dispersed through the kingdom. This is called the bishop's bible. He died in 1575, in his 72d year.

PARKER (Samuel), an English bishop, was born at Northampton in 1640, and lived at Wadham college, Oxford. He sided with the prevalent party after the example of his father, who having been bred to the law was made a member of the high court of justice in 1649, where he gave sentence against the lords Capel, Holland, and Hamilton, who were beheaded. During the protectorate he was made an assistant committee man for his county. In 1650, he published a treatise in defence of the new government as a commonwealth, without a king or house of lords, and was appointed by the rump parliament one of the barons of the exchequer; notwithstanding which, on the return of Charles II. he obtained a regular call as serjeant at law by the recommendation of chancellor Hyde. The son, Samuel, the subject of this article, had been bred among puritans, and entered into the society of Gruellers, a name given them for their constant fasting and praying. Upon the restoration, he became a zealous anti-puritan; and in the reign of James

II. he obtained the bishopric of Oxford. After this he was made a privy counsellor, and constituted by a royal mandamus president of Magdalen college, Oxford. He purchased these favours by complying with the king's commands, and writing some pieces which favoured the popish doctrine of transubstantiation and saint worship. He died in 1687.

PARKER (Henry, Lord Morley), in Henry the eighth's time was one of the barons who signed the memorable letter to Clement VII. threatening him with the loss of his supremacy in England, unless he proceeded to dispatch the divorce of the king. A list of his works may be seen in Mr. Walpole's (lord Orford's) Catalogue of royal and noble Authors, vol. 1.

PARKHURST (John), a learned English divine, was the second son of John Parkhurst, Esq. of Catesby-house, Northamptonshire. He was born in June, 1728, and educated first at Rugby, then at Clare-Hall, Cambridge, of which, in 1751, he was admitted fellow. He took his degrees in arts; and afterwards settled at Epsom, in Surrey. Mr. Parkhurst was the intimate friend of bishop Horne, and like him had a great partiality to the opinions of Hutchinson. He published a Greek and English Lexicon, 4to.; a Hebrew and English Lexicon, 4to.; and an answer to Dr. Priestley on the pre-existence of Christ. His Lexicons now published in 8vo. are very useful. He died in February, 1797. An interesting account of Mr. Parkhurst's life is prefixed to the later editions of his Greek Lexicon; from which we transcribe the following anecdote; as it shews the high sense he entertained of strict justice, and the steady resolution with which he practised it. One of his tenants falling behind-hand in the payment of his rent, which was 500l. per annum, it was represented to Mr. Parkhurst that it was owing to his being over-rented. This being believed to be the case, a new valuation was made: it was then agreed that, for the future, the rent should not be more than 450l. Justly inferring, moreover, that, if the farm was then too dear, it must necessarily have been always too dear; unasked, and of his own accord, he immediately struck off 50l. from the commencement of the lease; and instantly refunded all that he had received more than 450l. per annum.

PARKINSON (John), an English botanist, born in 1567. He was the first who singly described and figured the subjects of the flower garden. His *Theatrum Botanicum* contained a more copious history of physical herbs than any former publication: but his first work had a title which exhibited a pun or witticism upon his own name; it was called *Paridisi in sole, Paradisus terrestris*. *Paradisus* in sole meaning *Park-in-sun*.

PARKINSONIA. In botany, a genus of the class decandria, order monogynia. Calyx five-cleft; petals five, ovate, the lowermost kidney-form; styleless; legume moniliform. One species only; an American tree about twenty feet high, with prickly branches; long,

linear, pinnate leaves; flowers yellow on slender branches, of a most delightful scent.

PARLE. *s.* (from *parler*, French.) Conversation; talk; oral treaty (*Daniel*).

To PA'RLEY. *v. a.* (from *parler*, French.) To treat by word of mouth; to talk; to discuss any thing orally (*Broome*).

PA'RLEY. *s.* (from the verb.) Oral treaty; talk; conference; discussion by word of mouth (*Prior*).

PARLIAMENT, the grand assembly of the three estates of this kingdom; summoned together by the king's authority, to consider of matters relating to the public welfare, and particularly to enact and repeal laws.

The original or first institution of parliament is one of those matters which lie so far hidden in the dark ages of antiquity, that the tracing of it out is a thing equally difficult and uncertain. The word parliament itself (or colloquium, as some of our historians translate it) is, comparatively, of moderate date; derived from the French, and signifying "the place where they met and conferred together." It was first applied to general assemblies of the states under Louis VII. in France, about the middle of the 12th century. But it is certain, that, long before the introduction of the Norman language into England, all matters of importance were debated and settled in the great councils of the realm: a practice which seems to have been universal among the northern nations, particularly the Germans; and carried by them into all the countries of Europe, which they over-ran at the dissolution of the Roman empire, relics of which constitution, under various modifications and changes, are still to be met with in the diets of Poland, Germany, and Sweden, and lately in the assembly of the estates in France: for what was there called the parliament was only the supreme court of justice, consisting of the peers, certain dignified ecclesiastics, and judges; which neither was in practice, nor was supposed to be in theory, a general council of the realm.

In England, however, this general council hath been held immemorably, under the several names of *micel-synoth*, or great council; *micel-gemote*, or great meeting; and more frequently *wittena-gemote*, or the meeting of wise men. It was also styled in Latin, *commune concilium regni*; *magnum concilium regis*, *curia magna*, *conventus magnatum vel procerum*, *assisa generalis*, and sometimes *communitas regni Anglia*. We have instances of its meeting to order the affairs of the kingdom, to make new laws, and to amend the old, or, as Flea expresses it, *novis injuriis emersis nova constituere remedia*, so early as the reign of Ina king of the West Saxons, Offa king of the Mercians, and Ethelbert king of Kent, in the several realms of the heptarchy. And after their union, the Mirror informs us, that king Alfred ordained for a perpetual usage, that these councils should meet twice in the year, or oftener if need be, to treat of the government of God's people;

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how they should keep themselves from sin, should live in quiet, and should receive right. Our succeeding Saxon and Danish monarchs held frequent councils of this sort, as appears from their respective codes of laws; the titles whereof usually speak them to be enacted, either by the king with the advice of his wittena-gemote, or wise men, as *Hæc sunt instituta, quæ Edgarus rex consilio sapientium suorum instituit*; or to be enacted by those sages with the advice of the king, as, *Hæc sunt iudicia, quæ sapientes consilio regis Ethelstani instituerunt*; or lastly, to be enacted by them both together, as *Hæc sunt institutiones, quas rex Edmundus et episcopi sui cum sapientibus suis instituerunt*.

There is also no doubt but these great councils were occasionally held under the first princes of the Norman line. Glanvil, who wrote in the reign of Henry II. speaking of the particular amount of an amercement in the sheriff's court, says, it had never yet been ascertained by the general assize or assembly, but was left to the custom of particular counties. Here the general assize is spoken of as a meeting well known, and its statutes or decisions are put in a manifest contradistinction to custom, or the common law. And in Edward III.'s time, an act of parliament, made in the reign of William the Conqueror, was pleaded in the case of the abbey of St. Edmund's-bury, and judicially allowed by the court.

Parliament, then, is the legislative branch of the supreme power of Great Britain, consisting of the king, the lords spiritual and temporal, and the knights, citizens, and burgesses, representatives of the commons of the realm, in parliament assembled.

The power and jurisdiction of parliament is so transcendent and absolute, that it cannot be confined, either for causes or persons, within any bounds.

The parliament must be summoned by the king, and not by authority of either house, at least forty days before it sits, although the convention parliament (the house of commons), from necessity, was summoned by the keepers of the liberty of England, by authority of parliament. It cannot begin without the king in person, or by representation. The principal privileges of parliament are the privilege of speech, which is essential to its existence, and to which there are no exceptions, except in some precedents of information filed for using free language during the reign of the second Charles, which it is to be hoped will never be drawn into authority, and the privilege of person from arrest and imprisonment for debt. This privilege lasts for forty days after the prorogation of the parliament, and forty days previous to its meeting. But all other privileges derogating from the common laws and matters of civil right are abolished by several statutes; and by 4 George III. c. 33, a trader, being a member of parliament, may be served with legal process for any just debt to the amount of one hundred pounds, and unless he makes satisfaction within two months, it shall be an

act of bankruptcy. Vide statutes 12 William III. c. 3.; 2 and 3 Ann, c. 18.; 11 George II. c. 24. Statute 10 George III. c. 50. 4 Geo. III. c. 33.

It is one of the privileges of the peers to be entitled to vote by proxy, and also to enter a protest against any bill to which they may dissent. But all money bills must commence with the commons; and it is now the custom, if any alteration is made by the lords in a money bill, for the commons to reject it and bring in another, even though the new bill should contain the regulation proposed by the lords.

The house of commons is a denomination given to the lower house of parliament. In a free state, every man who is supposed a free agent ought to be in some measure his own governor, and therefore a branch at least of the legislative power should reside in the whole body of the people. In elections for representatives for Great Britain, anciently, all the people had votes; but king Henry VI. to avoid tumults, first appointed that none should vote for knights but such as were freeholders, did reside in the county, and had forty shillings yearly revenue. In so large a state as ours, therefore, it is very wisely contrived that the people should do that by their representatives, which it is impracticable to perform in person; representatives chosen by a number of minute and separate districts, wherein all the voters, or may be, easily distinguished. The counties are therefore represented by knights, elected by the proprietors of lands; the cities and boroughs are represented by citizens and burgesses, chosen by the mercantile, or supposed trading interest of the nation.

The peculiar laws and customs of the house of commons relate principally to the raising of taxes, and the elections of members to serve in parliament.

The method of making laws is nearly the same in both houses. In the house of commons, in order to bring in the bill, if the relief sought be of a private nature, it is first necessary to prefer a petition, which must be presented by a member, and usually set forth a grievance required to be remedied. This petition, when founded on facts of a disputable nature, is referred to a committee of members, who examine the matter alleged, and accordingly report it to the house; and then (or otherwise upon the mere petition), leave is given to bring in the bill. In public matters the bill is brought in upon motion made to the house, without any petition. If the bill begin in the house of lords, if of a private nature, it is referred to two judges, to make report. After the second reading, the bill is said to be committed, that is, referred to a committee, which is selected by the house, in matters of small importance; or, upon a bill of consequence, the house resolves itself into a committee of the whole house: a committee of the whole house is composed of every member, and to form it the speaker quits the chair, and may consequently sit and debate upon the merits of it as a private member, another mem-

For being appointed chairman, for the time. In these committees the bill is usually debated clause by clause, amendments made, and sometimes it is entirely new modelled. Upon the third reading, further amendments are sometimes made, and if a new clause be added, it is done by tacking a separate piece of parchment on the bill, which is called a rider. The royal assent may be given two ways. 1. In person, when the king comes to the house of peers, in his crown and royal robes, and sending for the commons to the bar, the titles of all the bills that have passed both houses are read, and the king's answer is declared by the clerk of the parliament. If the king consent to a public bill, the clerk usually declares, *le roy le veut*, the king wills it so to be; if to a private bill, *soit fait comme il est desire*, be it as it is desired. If the king refuse his assent, it is in the gentle language of *le roy s'avisera*, the king will advise upon it. When a bill of supply is passed, it is carried up and presented to the king by the speaker of the house of commons, and the royal assent is thus expressed, *le roy remercie ses loyal sujets, accepte leur benevolence, et aussi le veut*, the king thanks his loyal subjects, accepts their benevolence, and also wills it so to be. By the statute 33 Henry VIII. c. 21, the king may give his assent by letters patent under his great seal, signed with his hand, and notified in his absence to both houses assembled together in the upper house. And when the bill has received the royal assent in either of these ways, it is then, and not before, a statute or act of parliament.

An act of parliament thus made is the exercise of the highest authority that this kingdom acknowledges upon the earth. It has power to bind every subject in the land, and the dominions thereunto belonging; nay even the king himself, if particularly named therein. And it cannot be altered, amended, dispensed with, suspended, or repealed, but in the same forms, and by the same authority of parliament.

Adjournment is no more than a continuance of the session from one day to another, as the word itself signifies; and this is done by the authority of each house separately every day, or for a longer period; but the adjournment of one house is no adjournment of the other.

Prorogation is the continuance of the parliament from one session to another, as an adjournment is a continuation of the session from day to day. And this is done by the royal authority, expressed either by the lord chancellor, in his majesty's presence, or by commission from the crown, or frequently by proclamation; and by this both houses are prorogued at the same time; it not being a prorogation of the house of lords or commons, but of the parliament. The session is never understood to be at an end until a prorogation; though, unless some act be passed, or some judgment given in parliament, it is, in truth, no session at all.

A dissolution is the civil death of the parliament; and this may be effected three ways; 1. by the king's will, expressed either in person, or representation; 2. by the demise of the

crown; 3. by length of time. By the king's will; for as the king hath the sole right of convening the parliament, so also it is a branch of the royal prerogative, that he may, whenever he pleases, prorogue the parliament for a time, or put a final period to its existence.

By the demise of the crown; a dissolution formerly happened immediately upon the death of the reigning sovereign; but the calling a new parliament immediately on the inauguration of the successor being found inconvenient, and dangers being apprehended from having no parliament in being, in case of a disputed succession; it was enacted by statutes 7 and 8 William III. c. 15, and 6 Anne, c. 7, that the parliament in being shall continue for six months after the death of any king or queen, unless sooner prorogued or dissolved by the successor. That if the parliament be, at the time of the king's death, separated by adjournment or prorogation, it shall notwithstanding assemble immediately; and that if no parliament is then in being, the members of the last parliament shall assemble and be again in parliament. Lastly, a parliament may be dissolved or expire by length of time.

The utmost extent of time that the same parliament was allowed to sit by the statute of 6 William, c. 3, was three years, after the expiration of which, reckoning from the return of the first summons, the parliament was to have no longer continuance. But by statute 1 George I. c. 38, in order, as it was alleged, to prevent the great and continued expenses of frequent elections, and the violent heats and animosities consequent thereupon, and for the peace and security of the government just then recovering from the last rebellion, this term was prolonged to seven years. So that as our constitution now stands, the parliament must expire, or die a natural death, at the end of every seventh year, if not sooner dissolved by the royal prerogative. In favour of liberty, however, it were much to be wished that this statute had never been passed. The pretexes which it assigns, as the grounds upon which it was passed, are by no means satisfactory.

PARLIAMENT (the High Court of), is the supreme court of the kingdom, not only for the making, but also for the execution of laws, by the trial of great and enormous offenders, whether lords or commons, in the method of parliamentary impeachment. An impeachment before the lords, by the commons of Great Britain in parliament, is a prosecution of the already known and established law, and has been frequently put in practice; being a presentment to the most high and supreme court of criminal jurisdiction, by the most solemn grand inquest of the whole kingdom. A commoner cannot, however, be impeached before the lords for any capital offence, but only for high misdemeanors; a peer may be impeached for any crime. And they usually, in case of an impeachment of a peer for treason, address the crown to appoint a lord high steward, for the greater dignity and regularity of their proceedings; which high steward was formerly elected by the peers themselves, though

he was generally commissioned by the king; but it has of late years been strenuously maintained, that the appointment of a high steward in such cases is not indispensably necessary; but the house may proceed without one. The articles of impeachment are a kind of bills of indictment, found by the house of commons, and afterwards tried by the lords; who are in cases of misdemeanors considered not only as their own peers, but as the peers of the whole nation.

Much has been said and written upon the question of parliamentary reform, and the actual state of the parliament. The result of a candid inquiry will be this; namely, that the parliament, which has been, and now is the guardian of the liberties of the people, may hereafter by corruption become the means of their destruction, or the cause of their being surrendered, and the parliament itself have only a nominal existence. To prevent this, the people can only depend upon the frequent necessity of their representatives appealing to them for a renewal of their powers; that is, upon the frequency of elections, which in order also to be free should be made by as large a body of voters as possible, and that what are called rotten boroughs should at once be abolished. To object to this that it is an infringement of chartered rights, is an insult to common sense; for all charters are void that are against common right, and the only object of elections is for the benefit of the many, not for the private advantage of the few. That the present state of the representation of the people is not such as it ought to be, has been too generally admitted to be insisted upon here; but let it never be forgotten, that amongst those who have considered it as defective we must number Mr. Pitt, Mr. Fox, and the commentator Blackstone. In any future revision of the laws against bribery and corruption, it would be well to make the elected as well as the electors take the oath against bribery; and still further to narrow, though not wholly to exclude, the admission of placemen and contractors to seats in the house of commons. If the freedom of the press can be fully preserved, or obtained, we may venture to hope that every thing will ultimately be effected which the rational friends of freedom can desire; but a knowledge of our history will teach us, that little is to be gained for liberty by adherence to any precedents drawn from proceedings before the Revolution, the true principles of which seem the only genuine basis on which to rest the foundation of British liberty.

We shall conclude this article with an account of some general forms not taken notice of under any of the above heads.

In the house of lords, the princes of the blood sit by themselves on the sides of the throne; at the wall on the king's right hand, the two archbishops sit by themselves on a form. Below them the bishops of London, Durham, and Winchester, and all the other bishops sit according to the priority of their consecration. On the king's left hand the lord

treasurer, lord president, and lord privy-seal, sit upon forms above all dukes except the royal blood; then the dukes, marquesses, and earls, according to their creation. Across the room are wool-sacks, continued from an ancient custom; and the chancellor, or keeper, being of course the speaker of the house of lords, sits on the first wool-sack before the throne, with the great seal or mace lying by him; below these are forms for the viscounts and barons. On the other wool-sacks are seated the judges, masters in chancery, and king's council, who are only to give their advice in points of law: but they all stand up till the king gives them leave to sit.

The commons sit promiscuously; only the speaker has a chair at the upper end of the house, and the clerk and his assistant sit at a table near him.

When a member of the house of commons speaks, he stands up uncovered, and directs his speech to the speaker only. If what he says be answered by another, he is not allowed to reply the same day, unless personal reflections have been cast upon him: but when the commons, in order to have a greater freedom of debate, have resolved themselves into a committee of the whole house, every member may speak to a question as often as he thinks necessary. In the house of lords they vote, beginning at the puisne or lowest baron, and so up orderly to the highest, every one answering, *content* or *not content*. In the house of commons they vote by *yeas* and *nays*; and if it be dubious, which are the greater number, the house divides. If the question be about bringing any thing into the house, the *yeas* go out; but if it be about any thing the house already has, the *nays* go out. In all divisions the speaker appoints four tellers, two of each opinion. In a committee of the whole house, they divide by changing sides, the *yeas* taking the right and the *nays* the left of the chair; and then there are but two tellers. If a bill pass one house, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each house; and here the lords sit covered, and the commons stand bare, and debate the case. If they disagree, the affair is null; but if they agree, this, with the other bills that have passed both houses, is brought down to the king in the house of lords, who comes thither clothed in his royal robes; before him the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal assent or dissent. If it be a public bill, the royal assent is given in these words: *Le roy le veut*, "The king will have it so;" if private, *Soit fait comme il est désiré*, "Let the request be complied with;" if the king refuses the bill, the answer is *Le roy s'aviserà*, "The king will think of it;" and if it be a money-bill, the answer is, *Le roy remercie ses loyaux sujets, accepte leur benevolence, et aussi le veut*; "The king thanks his loyal subjects, accepts their benevolence, and therefore wills it."

PARLIAMENTARY. *a.* (from *parliament*.) Enacted by parliament; pertaining to parliament (*Bacon*).

PARLOUR. *s.* (*parloir*, French; *parlatorio*, Italian.) 1. A room in monasteries, where the religious meet and converse. 2. A room in houses on the first floor, elegantly furnished for reception or entertainment (*Spen.*).

PARLOUS. *a.* (from *perilous*.) Keen; sprightly; waggish (*Dryden*).

PARLOUSNESS. *s.* (from *parlous*.) Quickness; keenness of temper.

PARMA, the duchy of a province of Italy, bounded on the north by the Po; on the north-east by the Mantuan; on the east by the duchy of Modena; on the south by Tuscany; and on the west by the duchy of Placentia. The air is very wholesome, on which account the inhabitants live to a great age. The soil is very fertile in corn, wine, oil, and hemp; the pastures feed a great number of cattle, and the cheese is in very high esteem. Here are considerable mines of copper and silver, and plenty of truffles, which many are very fond of. The cheese called Parmesan is no longer made in this country, but at Lodi in the Milanese, at Trino, Bologna, and some other places.

PARMA, a fortified city of Italy, capital of a duchy of the same name, and a bishop's see, with a citadel, and a university. It has a magnificent cathedral, many beautiful churches, and handsome streets. The cupola of the cathedral, and the church of St. John, are painted by the famous Correggio, who was a native of this place; and in the church of la Madonna della Stoccata are the tombs of the Farnese family. The other most remarkable places are the ducal palace, with its gallery and collection of artificial curiosities; the celebrated opera house, capable of containing 14,000 spectators; the large Benedictine convent, in which 12,000 soldiers were quartered in 1734; the Palazzo Giardino, a ducal palace connected with the town; and the promenade, between the town and citadel. The inhabitants, about 38,000, trade in silk and silk stockings. In 1734 a battle was fought here between the Austrians and the French and Sardinians, in which the former were defeated. Parma is situate on a river of the same name, which divides it into two parts, united by three bridges, 40 miles N.W. of Modena, and 60 S.E. of Milan. Lon. 10. 30 E. Lat. 44. 50 N.

PARMENIDES, a Greek philosopher of Elis, who flourished about 505 years before Christ. He was the pupil of Xenophanes, or Anaximander according to some. He maintained that there were only two elements, fire and the earth; and taught that the first generation of men was produced from the sun. He first discovered that the earth was round, and that it was placed in the centre of the universe.

PARMENIO, a celebrated general in the armies of Alexander, who was more attached to his person as a man than as a monarch. When Darius king of Persia offered Alexander all the country west of the Euphrates, with

his daughter Statura in marriage, and 10,000 talents of gold, Parmenio observed that he would accept these conditions if he were Alexander; "So would I, were I Parmenio," replied Alexander. This friendship so inviolable was sacrificed at a moment of suspicion, and Alexander who had too eagerly listened to a light accusation, ordered Parmenio and his son to be put to death, as if guilty of treason. Parmenio died in the 70th year of his age, B. C. 330; and it has been judiciously observed, that Parmenio obtained many victories without Alexander, but Alexander not one without Parmenio.

PARMESAN CHEESE. See **CHEESE**.

PARNASSIA. Grass of Parnassus. In botany, a genus of the class pentandria, order tetragynia. Calyx five-parted; petals five; nectaries five, heart-shaped, fringed with bristles ending in globular tips: flower terminal, single and white streaked with yellow. Indigenous to the bogs of our own country; sometimes cultivated.

PARNASSUS, a mountain of Phocis, one of the highest in Europe, anciently called Larnassos, from the boat of Deucalion *καρυαξ*, which was carried there in the universal deluge. It received the name of Parnassus from Parnassus the son of Neptune, and was sacred to the Muses, and to Apollo and Bacchus. The mountain, according to the poets, had only two tops, called Hyampea and Tethorea, on one of which the city of Delphi was situated.

PARNELL (Dr. Thomas), a very ingenious divine and poet in the early part of last century. He was archdeacon of Clogher, and the intimate friend of Mr. Pope; who published his works, with an elegant copy of commendatory verses prefixed. He died in 1718, aged 39. Johnson says, "The life of Dr. Parnell is a task which I should very willingly decline, since it has been lately written by Goldsmith, a man of such variety of powers, and such felicity of performance, that he always seemed to do best that which he was doing; a man who had the art of being minute without tediousness, and general without confusion; whose language was copious without exuberance, exact without constraint, and easy without weakness.

"What such an author has told, who would tell again? I have made an extract from his larger narrative; and shall have this gratification from my attempt, that it gives me an opportunity of paying due tribute to the memory of a departed genius. 'Το γὰρ γένος ἐστὶ δαίμωνιον.'

"The general character of Parnell is not great extent of comprehension, or fertility of mind. Of the little that appears still less is his own. His praise must be derived from the easy sweetness of his diction: in his verses there is more happiness than pains; he is sprightly without effort, and always delights though he never ravishes; every thing is proper, yet every thing seems casual. If there is some appearance of elaboration in the Hermit, the narrative, as it is less airy, is less pleasing.

Of his other compositions it is impossible to say whether they are the productions of nature, so excellent as not to want the help of art, or of art so refined as to resemble nature."

PARNUS, in the entomology of Fabricius, a tribe of the coleopterous genus *ELATER*, which see.

PARO'CHIAL. *a.* (*parochialis*, from *parochia*, low Lat.) Belonging to a parish (*Atterbury*).

PARODY, a popular maxim, adage, or proverb.

PARODY is also a poetical pleasantry, consisting in applying the verses written on one subject, by way of ridicule, to another; or in turning a serious work into a burlesque, by affecting to observe as near as possible the same rhymes, words, and cadences. The parody was first set on foot by the Greeks; from whom we borrow the name. It comes near to what some of our late writers call travesty. Others have more accurately distinguished between a parody and burlesque; and they observe, that the change of a single word may parody a verse; or of a single letter a word. Thus, in the last case, Cato exposed the inconstant disposition of Marcus Fulvius Nobilior, by changing Nobilior into Mobilior. Another kind of parody consists in the mere application of some known verse or part of a verse of a writer, without making any change in it, with a view to expose it. A fourth instance is that of writing verses in the taste and style of authors little approved.

PAROLE. *s.* (*parole*, Fr.) Word given as an assurance; promise given by a prisoner not to go away (*Cleveland*).

PARONOMA'SIA. *s.* (*παρωνομασια*.) A rhetorical figure, in which, by the change of a letter or syllable, several things are alluded to.

PARONYCHIA. (*παρωνυχια*; from *παρ*, about, and *ονυξ*, the nail.) Panaris. Panaritium. A whitlow, or whitloe. Any collection of pus formed in the fingers is termed by authors panaris, or whitloe, and is an abscess of the same nature with those arising in other parts of the body. These abscesses are situated more or less deep, which has induced the writers upon the subject to divide them into several species: accordingly they have ranged them under four heads, agreeable to the places where they are formed. The first kind of panaris is formed under the cuticle, on one side of the nail, and sometimes all round it. The second is seated in the fat lying under the skin, between that and the sheath which involves the flexor tendons. The third is described by authors to be formed within the sheath; and they still add a fourth species, arising between the periosteum and the bone.

PARONYMOUS. *a.* (*παρωνυμος*.) Resembling another word (*Watts*).

PAROQUET. *s.* (*parroquet*, or *perroquet*, Fr.) A small species of parrot (*Grew*).

PARORCHIDIUM. (*παρορχιδιον*; from *παρ*, and *ορχις*, a testicle.) A tumour in the groin, occasioned by the testicle, which is passing into the scrotum.

PAROS, a celebrated island among the Cyclades. Pliny says it is about 36 miles in circumference. It received the name of Paros, which it still bears, from Paros, a son of Jason, or as some maintain, of Parrhasius. The island of Paros was rich and powerful, and well known for its famous marble, always used by the best statuary. Here modern travellers see quarries of a most extraordinary depth, whence the labyrinth of Egypt, and the porticoes of Greece received their splendor; they were so uncommonly deep, that in the clearest weather the workmen were obliged to use lamps. Paros is also famous for the fine cattle which it produces, and for its partridges and wild pigeons. The capital city was called Paros. The poet Archilochus was born there. The Arundelian marbles were engraved in this island in capital letters, B. C. 204, and as a valuable chronicle, preserved the most celebrated epochas of Greece from the year 1582, B. C.

PAROS, a town of the Archipelago, capital of the isle of Paros. It was anciently the largest and most powerful town of the Cyclades; but is greatly decayed. The walls of the castle are built of ancient pieces of marble, and most of the columns are placed longwise: some of them that stand upright support cornices of amazing size. The natives build their houses of marble, which they find ready cut to their hands; but they take no care to place the pieces in a regular manner: their fields likewise are inclosed with friezes, altars, and basso relievos. The inhabitants are so ignorant now, that, instead of great sculptors and skilful architects, they have nothing but carvers of mortars and salt-cellars. Paros is a bishop's see, and situate on the W. coast of the island. Lon. 25. 44 E. Lat. 37. 8 N.

PAROTID GLAND. (from *παρ*, about, and *ος*, the ear.) A large conglomerate and salivary gland, situated under the ear, between the mamillary process of the temple bone, and the angle of the lower jaw. The excretory duct of this gland opens in the mouth, and is called, from its discoverer, the Stenonian duct.

PAROXYSM. (*παροξυσμος*; from *παροξυνω*, to aggravate.) A periodical exacerbation or fit of a disease.

PARR (Catherine), sixth queen to Henry VIII. was daughter of sir Thomas Parr, and widow of lord Latimer. She was well skilled in divinity, upon which she frequently conversed with the king. She laboured much for the establishment of the reformation, and her interference proved at one time so disagreeable to the monarch, that he permitted Gardiner to draw articles of impeachment against her, but her prudence restored her to the affection of the king. After Henry's death she married sir Thomas Seymour, who treated her with great harshness, so that she died the next year in child-bed, not without suspicion of poison, 1548.

PARR (Thomas), a peasant of Shropshire, who lived to the great age of 152 years and nine months. He performed penance in his

parish church at the age of 105 for a bastard child, and at 120 he married a second wife, by whom he had a child. He was in 1635 brought to London, and introduced to Charles I, but the change of situation, and particularly drinking wine, proved fatal to a constitution hitherto supported by more temperate and abstemious habits, and he died the same year.

The following summary of his life is copied from Oldys's MS. notes on Fuller's Worthies: Old Parr was born 1483; lived at home until 1500, aged 17, when he went out to service; 1518, aged 35, returned home from his master; 1522, aged 39, spent four years on the remainder of his father's lease: 1543, aged 60, ended the first lease he renewed of Mr. Lewis Porter; 1563, aged 80, married Jane, daughter of John Taylor, a maiden; by whom he had a son and a daughter, who both died very young; 1564, aged 81, ended the second lease which he renewed of Mr. John Porter; 1585 aged 102, ended the third lease he had renewed of Mr. Hugh Porter; 1588, aged 105, did penance in Alderbury church, for lying with Katharine Milton, and getting her with child; 1595, aged 112, he buried his wife Jane, after they had lived 32 years together; 1605, aged 122, having lived ten years a widower, he married Jane, widow of Anthony Adda, daughter of John Lloyd of Gilsells, in Montgomeryshire, who survived him; 1635, aged 152, he died; after they had lived together 30 years, and after 50 years possession of his last lease. See LONGEVITY.

PARRA. Jacana. In zoology, a genus of the class aves, order grallæ. Bill tapering, somewhat obtuse; nostrils oval, in the middle of the bill; front covered with lobate caruncles; wings spinous. Sixteen species, natives of the warmer parts of Asia, Africa, and America. The following are examples:

1. *P. Chilensis.* Chilese jacana. Claws moderate; legs brown; hind-head subcrested; bill conic, two inches long, a little curved at the tip; irids yellowish; nostrils pervers, square; caruncle two-lobed, red; neck, back and fore-part of the wings violet; throat and breast black; wings and short tail brown; spurs on the wings yellowish, conic, bony, half an inch long. Inhabits Chili; size of a jay, but the legs longer; feeds on worms and insects; is noisy, and defends itself by the spurs on its wings; builds in the grass, and lays four tawny eggs, speckled with black.

2. *P. jacana.* Chesnut jacana. Hind-claws very long; legs greenish; bill tawny; body chesnut-purple; head and neck beneath violet-black; quill-feathers olive-green, edged at the tip with brown; tail-feathers at the tip black-violet, two middle ones varied with bay and brown; spurs on the wings strong, yellow; caruncle orange, two-parted, hanging each side the head. Inhabits watery places of South America; ten-inches long; is very noisy, and continually making a shrill cry; generally seen in pairs; flesh good.

3. *P. chavaria.* Faithful jacana. Toes long; legs tawny; hind-head crested; bill

dirty-white, upper mandible like that of the dung-hill cock; on both sides at the base of the bill a red membrane extending to the temples, in the middle of which are the eyes; irids brown; crest on the hind-head consists of about twelve black feathers, three inches long, pendent; rest of the neck covered with thick black down; body brown, wings and tail blackish; wing-spurs two or three half an inch long; belly light black; thighs half bare; toes so long as to entangle each other in walking. Inhabits the rivers and inundated places near Carthage in America; feeds on herbs; its gait is slow, and it cannot run unless assisted by the wings, but flies easily and swiftly. When the skin is touched a crackling is felt; voice clear and loud. The natives keep one of these birds tame to wander with the poultry and defend them against birds of prey, which it does by means of the spurs on its wings. It never deserts the charge committed to its care, but brings them home at night. It will readily suffer itself to be handled by adults, but not by children; is about the size of a cock, and stands a foot and half from the ground. See Nat. Hist. Pl. CLXI.

PARRAKEET, in ornithology. See *Pica*.

PARRAMATTA, a town or settlement of English convicts in New South Wales. It is seated at the head of the harbour of Port Jackson, 11 miles W. of Sydney Cove, between Rose Hill and the landing-place in the creek which forms the head. In 1791, near 1000 acres of land were either in cultivation, or cleared for that purpose; and the soil, in most places, was found to be remarkably good. Lon. 151. 39 E. Lat. 33. 50 S.

PARRELS, in a ship, are frames made of trucks, ribs, and ropes, which having both their ends fastened to the yards, are so contrived as to go round about the masts, that the yards by their means may go up and down upon the mast. These also, with the breast-ropes, fasten the yards to the masts.

PARRET, a river in Somersetshire, which rises in the S. part of the county, receives the Ivel and Thone, and enters the Bristol Channel, at Bridgewater Bay.

PARRHASIA, a town of Arcadia, founded by Parrhasius, the son of Jupiter. The Arcadians are sometimes called Parrhasians, and Arcas Parrhasis.

PARRHASIUS, a famous painter of Ephesus in the age of Zeuxis, about 415 years before Christ. He particularly excelled in strongly expressing the violent passions. He had much invention, and was peculiarly happy in his designs. He once entered the lists against Zeuxis, and when they had produced their respective pieces, the birds came to pick the grapes which Zeuxis had painted. Immediately Parrhasius exhibited his piece, and Zeuxis said, "Remove your curtain, that we may see the painting." The curtain was the painting, and Zeuxis acknowledged himself conquered by exclaiming, "Zeuxis has deceived birds, but Parrhasius has deceived Zeuxis himself."

PARRHASIUS (James), an Italian grammarian, born at Cosenza, 1470. He taught belles lettres and rhetoric at Milan, where he was much admired for his graceful delivery. On a charge of improper converse with his pupils, he retired to Vicenza, and afterwards to Rome. His application soon rendered him incapable of acting as professor, and upon his return home he fell into a fever, which proved fatal. He wrote some fragments of antiquity—commentaries on Horace's art of poetry—Ovid's—Claudian, &c.

PARRICIDE. *s.* (*parricide*, Fr.) 1. One who destroys his father (*Shakspeare*). 2. One who destroys or invades any to whom he owes particular reverence. 3. The murder of a father; murder of one to whom reverence is due (*Dryden*).

PARRICIDAL. **PARRICIDIOUS**. *a.* (from *parricida*, Lat.) Relating to parricide; committing parricide (*Brown*).

PARROCEL (Joseph), of Brignoles in Provence, was eminent as a painter and engraver. He studied under one of his brothers, and under Bourignon, and was admitted member of the French academy of painting. His portraits, and also his historical pieces, and his battles were executed with great taste and effect. He died 1704, aged 56. His son Charles was also an eminent artist, and died 1752, aged 53. His conquests of Louis XV. possess merit.

PARROT. In ornithology. See **PICA**.

To **PARRY**. *v. n.* (*parer*, French.) To put by thrusts; to fence (*Locke*).

To **PARSE**. *v. a.* (from *pars*, Lat.) To resolve a sentence into the elements or parts of speech (*Ascham*).

PARSHORE, a neat old town in Worcester-shire, having formerly an abbey church. At present it has two parishes, Holy Cross and St. Andrew; it contains about 320 houses; and has markets on Tuesdays and Saturdays.

PARSIMONIOUS. *a.* (from *parsimony*.) Covetous; frugal; sparing (*Addison*).

PARSIMONIOUSLY. *ad.* Covetously; frugally; sparingly (*Swift*).

PARSIMONIOUSNESS. *s.* (from *parsimonious*.) A disposition to spare and save.

PARSIMONY. *s.* (*parsimonia*, Lat.) Frugality; covetousness; niggardliness; saving temper (*Swift*).

PARSLEY. In botany. See **APIUM**.

PARSLEY (Macedonian). See **BUBON**.

PARSLEY (Stone). See **BUBON**.

PARSNIP. In botany. See **PASTINACA**.

PARSON. *s.* (*parochianus*, Lat.) 1. The priest of a parish; one that has a parochial charge or cure of souls (*Clarendon*). 2. A clergyman (*Shakspeare*). 3. It is applied to dissenting teachers.

PARSON, and **VICAR**. A parson, *persona ecclesiæ*, is one that hath full possession of all the rights of a parochial church. He is called parson, *persona*, because by his person the church, which is an invisible body, is represented; and he is in himself a body corporate, in order to protect and defend the rights of the

church (which he personates) by a perpetual succession. He is sometimes called the rector or governor of the church: but the appellation of parson (however it may be depreciated by familiar, clownish, and indiscriminate use) is the most legal, most beneficial, and most honourable title that a parish-priest can enjoy; because such a one (sir Edward Coke observes), and he only, is said *vicem seu personam ecclesiæ gerere*. A parson has, during his life, the freehold in himself of the parsonage house, the glebe, the tithes, and other dues. But these are sometimes appropriated; that is to say, the benefice is perpetually annexed to some spiritual corporation, either sole or aggregate, being the patron of the living; whom the law esteems equally capable of providing for the service of the church as any single private clergyman. See **APPROPRIATION**.

The appropriating corporations, or religious houses, were wont to depute one of their own body to perform divine service, and administer the sacraments, in those parishes of which the society was thus the parson. This officiating minister was in reality no more than a curate, deputy, or vicegerent of the appropriator, and therefore called *vicarius*, or vicar. His stipend was at the discretion of the appropriator, who was, however, bound of common right to find somebody, *qui illi de temporalibus, episcopo de spiritualibus debeat respondere*. But this was done in so scandalous a manner, and the parishes suffered so much by the neglect of the appropriators, that the legislature was forced to interpose: and accordingly it is enacted, by statute 15 Richard II. c. 6. that in all appropriations of churches, the diocesan bishop shall ordain (in proportion to the value of the church) a competent sum to be distributed among the poor parishoners annually; and that the vicarage shall be sufficiently endowed. It seems the parish were frequently sufferers, not only by the want of divine service, but also by withholding those alms for which, among other purposes, the payment of tithes was originally imposed: and therefore in this act a pension is directed to be distributed among the poor parochians, as well as a sufficient stipend to the vicar. But he, being liable to be removed at the pleasure of the appropriator, was not likely to insist too rigidly on the legal sufficiency of the stipend; and therefore, by statute 4 Henry IV. c. 12. it is ordained, that the vicar shall be a secular person, not a member of any religious house; that he shall be vicar perpetual, not removable at the caprice of the monastery; and that he should be canonically instituted and inducted, and be sufficiently endowed, at the discretion of the ordinary, for these three express purposes: to do divine service, to inform the people, and to keep hospitality. The endowments, in consequence of these statutes, have usually been by a portion of the glebe or land belonging to the parsonage, and a particular share of the tithes, which the appropriators found it most troublesome to collect, and which are therefore generally called petty or small tithes; the greater, or parial tithes,

being still reserved to their own use. But one and the same rule was not observed in the endowment of all vicarages. Hence some are more liberally, and some more scantily, endowed: and hence the tithes of many things, as wood in particular, are in some parishes rectorial, and in some vicarial tithes.

The distinction therefore of a parson and vicar is this: the parson has for the most part the whole right to all the ecclesiastical dues in his parish; but a vicar has generally an appropriator over him, entitled to the best part of the profits, to whom he is in effect perpetual curate, with a standing salary. Though in some places the vicarage has been considerably augmented by a large share of the great tithes; which augmentations were greatly assisted by the statute 27 Charles-II. c. 8. enacted in favour of poor vicars and curates, which rendered such temporary augmentations (when made by the appropriators) perpetual.

The method of becoming a parson or vicar is much the same. To both there are four requisites necessary; holy orders, presentation, institution, and induction.

For the rights of a parson or vicar, in his tithes and ecclesiastical dues, see **TITHES**. As to his duties, they are so numerous, that it is impracticable to recite them here with any tolerable conciseness or accuracy; but the reader who has occasion may consult bishop Gibson's *Codex*, Johnson's *Clergyman's Vade Mecum*, and Burn's *Ecclesiastical Law*. We shall therefore only just mention the article of residence, upon the supposition of which the law doth style every parochial minister an incumbent. By statute 21 Henry VIII. c. 13. persons willingly absenting themselves from their benefices, for one month together, or two months in the year, incur a penalty of 5*l*. to the king, and 5*l*. to any person that will sue for the same; except chaplains to the king, or others therein mentioned, during their attendance in the household of such as retain them; and also except all heads of houses, magistrates, and professors in the universities, and all students under forty years of age residing there, *bona fide*, for study. Legal residence is not only in the parish, but also in the parsonage house; for it hath been resolved, that the statute intended residence, not only for serving the cure and for hospitality, but also for maintaining the house, that the successor also may keep hospitality there.

We cannot terminate this article without recommending to those who have thoughts of entering the clerical profession the perusal of Izaak Walton's *Life of George Herbert*, rector of Bemerton; the same Mr. Herbert's admirable piece called *A Priest to the Temple*, or the Country Parson; the *Life of Hooker*, prefixed to his *Ecclesiastical Polity*; Burnet's *Pastoral Care*; Mason's *Pastor and Student*; and Dr. Campbell's *Lectures on the Pastoral Character*.

PARSONAGE. *s.* (from *parson*.) The benefice of a parish; a rectory (*Addison*).

PARSONS (Robert), or **PERSONS**, son of a

blacksmith near Bridgewater, was born 1646, and educated at Baliol college, Oxford, at the expence of the vicar of his parish. He became fellow and tutor of his college; but being accused of incontinence, and of embezzling the college money, he left the university, and retired to Antwerp, then to Louvain and Padua, and afterwards to Rome, where he renounced the protestant faith, and entered among the jesuits. The pope permitted him to establish an English college at Rome, for the instruction of missionaries to attempt the conversion of the English nation. He came himself in disguise to London; but his violent attack against the religion of England, and the doctrine that Elizabeth might safely be deposed, were too daring to be long concealed from Burleigh, yet he escaped his pursuers. On the preparations of Philip to invade England, the good father stirred up not only foreigners, but natives, against their country; and when the armada was destroyed, he endeavoured to excite a rebellion in the kingdom. This insidious, and intriguing jesuit, died 1610. His writings were 33 tracts, chiefly on divinity and controversial subjects.

PARSONS (James), a learned physician, born at Barnstaple, in Devonshire, in 1705. His father being appointed barrack-master, at Bolton, in Ireland, he received his education in Dublin; from whence he went to Paris, where he attended Astruc, and others equally eminent, as also the chemical lectures of Lemery and Bouldue, and those of botany, by Jussieu. He went to the university of Rheims, in Champagne, and obtained his degrees in 1736. In July of the same year, he came to London, and in 1740, was elected a member of the royal society. In 1751, he was admitted a licentiate of the college of physicians. Through the interest of his friend Dr. Douglas he was appointed physician to the infirmary of St. Giles's. He died after a week's illness, 1770, universally regretted.

PART. *s.* (*pars*, Lat.) 1. Something less than the whole; a portion; a quantity taken from a larger quantity (*Knolles*). 2. Member (*Locke*). 3. Particular; distinct species (*Law*). 4. Ingredient in a mingled mass (*Blackmore*). 5. That which, in division, falls to each (*Dryden*). 6. Proportional quantity (*Chapman*). 7. Share; concern (*Pope*). 8. Side; party; interest; faction (*Daniel*). 9. Something relating or belonging (*Shakspeare*). 10. Particular office or character (*Bacon*). 11. Character appropriated in a play (*Shakspeare*). 12. Business; duty (*Bacon*). 13. Action; conduct (*Shakspeare*). 14. Relation reciprocal (*Tillotson*). 15. In good part; in ill part; as well done; as ill done (*Hooker*). 16. (In the plural.) Qualities; powers; faculties; or accomplishments (*Sidney*). 17. (In the plural.) Quarters; regions; districts (*Sidney*). 18. For the most part. Commonly; oftener than otherwise (*Heylin*).

PART, in music, the name of each of the melodies of any harmonic composition, and which, when performed in union, form its

harmony. Four is the fewest number of parts with which the chords necessary to elaborate harmony can be completely filled.

At the first introduction of counterpoint there were only two parts, one of which was called tenor, and the other discant. At length a third was added called triplum, and afterwards a fourth called quadruplum. There are instrumental parts; as organ part, violin part, violoncello part, &c. and the paper or book on which is separately written the particular melody appropriated to any single performer, or set of performers of the same melody, is called a part. In concert, every performer, except the composer, or conductor, who generally uses the score, sings or plays from his single part.

PARTS OF VEGETABLES (Primary), are, 1. The root, descending, imbibing fluid, nourishing. 2. The herb, ascending, breathing air, moving. 3. The fructification, expanding, inhaling ether, generating.

PARTS OF SPEECH, in grammar. See GRAMMAR.

PART. ad. Partly; in some measure (*Shakespeare*).

To **PART. v. a.** 1. to divide; to share; to distribute (*Acts*). 2. To separate; to disunite (*Dryden*). 3. To break into pieces (*Leviticus*). 4. To keep asunder (*Shaks.*). 5. To separate combatants (*Shakspeare*). 6. To seceren (*Prior*).

To **PART. v. n.** 1. To be separated (*Dryden*). 2. To quit each other (*Swift*). 3. To take farewell (*Shakspeare*). 4. To have share (*Isaiah*). 5. (*partir, Fr.*) To go away; to set out (*Dryden*). 6. To **PART with.** To quit; to resign; to lose; to be separated from (*Tay.*).

PARTABLE. a. (from *part.*) Divisible; such as may be parted (*Camden*).

PARTAGE. s. (*partage, Fr.*) Division; act of sharing or parting (*Locke*).

To **PARTAKE. v. n.** preterit, *partook*; participle passive, *partaken.* (*part* and *take.*) 1. To have share of any thing; to take share with (*Locke*). 2. To participate; to have something of the property, nature, claim, or right (*Bacon*). 3. To be admitted to; not to be excluded (*Shakspeare*). 4. To combine; to unite in some bad design.

To **PARTAKE. v. a.** 1. To share; to have part in (*Milton*). 2. To admit to part; to extend participation to: obsolete (*Spenser*).

PARTAKER. s. (from *partake.*) 1. A partner in possessions; a sharer of any thing; an associate with (*Hooker*). 2. Sometimes with in before the thing partaken (*Shakspeare*). 3. Accomplice; associate (*Psalms*).

PARTER. s. (from *part.*) One that parts or separates (*Sidney*).

PARTERRE, in gardening, a level division of ground, which, for the most part, faces the south, and best front of a house; and is generally furnished with greens, flowers, &c.

PARTHENAY, a town of France, in the department of Two Sevres. It carries on a considerable trade in cattle and corn, and is seated on the Thoue, 17 miles S. of Thours. Lon. 0. 19 W. Lat. 46. 44 N.

PARTHENAY (Anne de), a lady of great genius and learning, and wife of Anthony de Pons, count de Marennnes. She was one of the brightest ornaments of the court of the duchess of Ferrara, being a proficient in the Latin and Greek languages. She was a follower of Calvin, and took great pains to propagate his principles.

PARTHENAY (Catharine de), niece of the above lady, and heiress to the lordship of Soubise; was married in 1568, at the age of 14, to the baron de Pons; and in 1575, to René, viscount Rohan. The famous duke de Rohan, who so courageously defended the protestant cause in France during the civil wars of Louis XIII. was her eldest son. Catharine, one of her three daughters, who married the duke of Deux-Ponts, made the following answer to Henry IV. her admirer, "I am too poor, sire, to be your wife, and too proud to be your mistress." She died in 1607.

PARTHENIÆ and **PARTHENI**, a certain number of desperate citizens of Sparta. They were the offspring of all the young men employed in the Messenian war, who had not taken an oath not to return to Sparta before Messenia was subdued. They left the army commissioned to raise a future generation by a familiar and promiscuous intercourse with all the unmarried women of the state, and the children sprung from this union were called Partheniæ, or sons of virgins (*παρθενος*). The Partheniæ, upon the return of the Spartans from the war, finding themselves despised on account of their illegitimacy, conspired with the Helots against the state, and, at length, with Phalantus their ring-leader at their head, they settled in Magna Græcia, and built Tarantum, about 707 years before Christ.

PARTHENIUM. Bastard-feverfew. In botany, a genus of the class syngenesia, order polygamia necessaria. Receptacle chaffy, flat; seeds obovate, mostly naked; calyx five-leaved: two species.

1. *P. hystrophorus.* Cut-leaved bastard feverfew: wild wormwood. An annual of the West Indies; possessing much the same qualities as common feverfew; flowering among us in July and August.

2. *P. integrifolium.* Entire-leaved parthenium. A perennial of Virginia, rising about three feet, with thick, round, fleshy stems, flowers corymbed and terminal, heads snow-white above, like those of gnaphalium, whitish-green below.

PARTHENIUS, a river of Paphlagonia, which, after separating Bithynia, falls into the Euxine sea, near Sesamum. It received its name either because the virgin Diana bathed herself there, or perhaps it received it from the purity and mildness of its waters.—2. A favourite of the emperor Domitian. He conspired against his imperial master, and assisted to murder him.

PARTHENON, a temple of Athens, sacred to Minerva. It was destroyed by the Persians, and afterwards rebuilt by Pericles, in a more magnificent manner. All the cir-

cumstances which related to the birth of Minerva were beautifully and minutely represented in bass-relief, on the front of the entrance. The statue of the goddess was 26 cubits high, and made of gold and ivory. It passed for one of the master-pieces of Phidias.

PARTHENOPEUS, a son of Meleager and Atalanta, was one of the seven chiefs who accompanied Adrastus the king of Argos in his expedition against Thebes. He was killed by Amphilichus.

PARTHENOPE, one of the Sirens.—A city of Campania, afterwards called Neapolis, or the new city, when it had been beautified by a colony from Eubœa. It is now called Naples. It received the name of Parthenope from one of the Sirens, whose body was found on the shore there.

PARTHIA, a celebrated country of Asia, bounded on the west by Media, south by Carmania, north by Hyrcania, and east by Aria, &c. containing, according to Ptolemy, 25 large cities, the most capital of which was called Hecatompylos from its hundred gates. According to some authors the Parthians were Scythians by origin. They became successively tributary to the empire of the Assyrians, Medes, and Persians, and when Alexander invaded Asia, they submitted like the other dependent provinces of Persia. Arsaces, a man of obscure origin, but of great military powers, roused at length by the oppression of Agathocles, a lieutenant of Antiochus, placed himself at the head of his countrymen, and laid the foundation of the Parthian empire, about 250 years before the Christian era. The Macedonians attempted in vain to recover it, and a race of active princes, who assumed the surnames of Arsacides from the founder, rendered it so formidable, that it even disputed the empire of the world with the Romans. It remained a kingdom till the reign of Artabanus, who was killed about the year 229 B.C. and from that time it became a province of the newly re-established kingdom of Persia, under Artaxerxes. The Parthians were naturally strong and warlike, and were esteemed the most expert horsemen and archers in the world.

PARTI, **PARTIE**, **Party**, or **Parted**, in heraldry, is applied to a shield or escutcheon, denoting it divided or marked out into partitions. *Parti per pale*, is when the shield is divided perpendicularly into two halves, by a cut in the middle from top to bottom. *Parti per fess*, is when the cut is across the middle from side to side. *Parti per bend dexter*, is when the cut comes from the upper corner of the shield on the right hand, and descends athwart to the opposite lower corner. *Parti per bend sinister*, is when the cut, coming from the upper left corner, descends across to the opposite lower one. All these partitions, according to M. de la Colombiere, have their origin from the cuts and bruises that have appeared on shields after engagements; and, being proofs of the dangers to which the bearers had been exposed, they gained them esteem: for which reason they were transmitted to

posterity, and became arms and marks of honour to their future families.

PARTIAL. *a. (partial, French.)* 1. Inclined antecedently to favour one party in a cause, or one side of the question more than the other (*Malachi*). 2. Inclined to favour without reason (*Locke*). 3. Affecting only one part; subsisting only in one part; not general (*Burnet*).

PARTIAL UMBEL, in botany; otherwise called umbellule. A smaller umbel, proceeding from the general or universal umbel. Umbellula quæ prodiit ex universalis. The involucre at the foot of this is called the partial involucre. Involucrum partiale. Pedunculus partialis, a partial peduncle, is a subdivision of a common peduncle. See **UMBEL** and **PEDUNCLE**.

PARTIALITY. *s. (partialité, Fr. from partial.)* Unequal state of the judgment and favour of one above the other (*Spenser*).

To PARTIALIZE. *v. a. (partialiser, Fr. from partial.)* To make partial (*Shakspeare*).

PARTIALLY. *ad. (from partial.)* 1. With unjust favour or dislike. 2. In part; not totally (*Rogers*).

PARTIBILITY. *s. (from partible.)* Divisibility; separability.

PARTIBLE. *a. (from part.)* Divisible; separable (*Digby*).

PARTICIPABLE. *a. (from participate.)* Such as may be shared or partaken (*Norris*).

PARTICIPANT. *a. (participant, French.)* Sharing; having share or part (*Bacon*).

To PARTICIPATE. *v. a. (participo, Latin; participer, French.)* 1. To partake; to have share (*Shakspeare*). 2. To have part of more things than one (*Denham*). 3. To have part of something common with another (*Bacon*).

To PARTICIPATE. *v. a.* To partake; to receive part of; to share (*Hooker*).

PARTICIPATION. *s. (participation, Fr. from participate.)* 1. The state of sharing something in common (*Hooker*). 2. The act or state of receiving or having part of something (*Stillingfleet*). 3. Distribution; division into shares (*Raleigh*).

PARTICIPIAL. *a. (participialis, Latin.)* Having the nature of a participle.

PARTICIPIALLY. *ad.* In the sense or manner of a participle.

PARTICIPLE. *a. (participium, Latin.)* 1. A word partaking at once the qualities of a noun and verb. (See **GRAMMAR**). 2. Any thing that participates of different things: not used (*Bacon*).

PARTICLE. *s. (particule, French; particula, Latin.)* 1. Any small proportion of a greater substance (*Newton*). 2. A word unvaried by inflection (*Hooker*).

PARTICLE, a term in theology, used in the Latin church for the crumbs or little pieces of consecrated bread called in the Greek church *μερίδες*. The Greeks have a particular ceremony, called *τρυβ μερίδων*, of the particles, wherein certain crumbs of bread, not consecrated, are offered up in honour of the Virgin,

St. John Baptist, and several other saints. They also give them the name of *προσφορά*, oblation. Gabriel archbishop of Philadelphia wrote a little treatise express *περι των μεριδων*, wherein he endeavours to shew the antiquity of this ceremony, in that it is mentioned in the liturgies of St. Chrysostom and Basil.— There has been much controversy on this head between the reformed and catholic divines.

PARTICLE, in grammar, a denomination for all those small words that tie or unite others together, or that express the modes or manners of words, usually included by grammarians under these four parts of speech, viz. adverbs, prepositions, interjections, and conjunctions.

PARTICULAR. *a.* (*particulier*, French.)

1. Relating to single persons; not general.
2. Individual; one distinct from others (*Dryden*).
3. Noting properties or things peculiar: *he had nothing particular in his conduct* (*Bacon*).
4. Attentive to things single and distinct.
5. Single; not general (*Sidney*).
6. Odd; having something that eminently distinguishes him from others.

PARTICULAR. *s.* 1. A single instance; a single point (*South*). 2. Individual; private person (*L'Estrange*). 3. Private interest (*Hooker*). 4. Private character; single self; state of an individual (*Shakspeare*). 5. A minute detail of things singly enumerated (*Ayliffe*). 6. *In particular*. Peculiarly; distinctly (*Dryden*).

PARTICULARITY. *s.* (*particularité*, Fr.) 1. Distinct notice or enumeration (*Sidney*). 2. Singleness; individuality (*Hooker*). 3. Petty account; private incident (*Addison*). 4. Something belonging to single persons (*Shakspeare*). 5. Something peculiar (*Addison*).

To PARTICULARIZE. *v. a.* (*particulariser*, French.) To mention distinctly; to detail; to show minutely (*Atterbury*).

PARTICULARLY. *ad.* (*from particular*.) 1. Distinctly; singly; not universally (*South*). 2. In an extraordinary degree (*Dryden*).

To PARTICULARIZE. *v. a.* (*from particular*.) To make mention singly; obsolete (*Camden*).

PARTIES, are those which are named in a deed or fine, as parties to it. See **FINE**.

PARTISAN. *s.* (*pertuisan*, French.) 1. A kind of pike or halberd (*Shakspeare*). 2. (*from parti*, French.) An adherent to a faction (*Addison*). 3. The commander of a party detached from the main body upon some sudden excursion. 4. A commander's leading staff (*Ainsworth*).

PARTITE LEAF. In botany, a parted leaf. Simple, but divided almost down to the base. According to the number of divisions it is called bipartite, tripartite, &c. Bipartite, or two-parted; tripartite, or three-parted, &c. It is applied in the same sense to the perianth and corol.

PARTITION. *s.* (*partition*, French; *partitio*, Latin.) 1. The act of dividing; a state of being divided (*Shakspeare*). 2. Division; separation; distinction (*Hooker*). 3. Part

divided from the rest; separate part (*Milton*). 4. That by which different parts are separated (*Bacon*). 5. Part where separation is made (*Dryden*).

PARTITION. *Dissepimentum*. In botany, a wall separating a pericarp internally into cells. This is either parallel; that is, approaching in breadth and its transverse diameter to the valves: as in lunaria and draba. Or, contrary; that is, narrower than the valves: or, as it is expressed more fully in *Delin. Pl.*—narrower, when the valves by being squeezed or contracted become concave. *Angustus ubi valvulæ coarctatæ evadunt concavæ*. This is exemplified in biscutella and thlaspi. Linnæus borrowed these terms from Tournefort; and says that they are to be understood cum grano salis. We should have conceived a parallel partition in a silique or pod to have been in the direction of the valves; a contrary or transverse one, at right angles with the valves.

To PARTITION. *v. a.* To divide into distinct parts (*Bacon*).

PARTLET. *s.* A name given to a hen; the original signification being a ruff or band, or covering for the neck (*Hall*).

PARTLY. *ad.* (*from part*.) In some measure; in some degree; in part (*Addison*).

PARTNER. *s.* (*from part*.) 1. Partaker; sharer; one who has part in any thing; associate (*Milton*). 2. One who dances with another (*Shakspeare*).

To PARTNER. *v. a.* (*from the noun*.) To join; to associate with a partner (*Shakspeare*).

PARTNERSHIP. *s.* (*from partner*.) 1. Joint interest or property (*Dryden*). 2. The union of two or more in the same trade.

PARTOOK. The preterit of *partake*.

PARTRIDGE. (See **TETRAO**.) The partridge being naturally a cowardly, fearful, simple bird, is easily deceived or beguiled with any device whatever, by train-bait, engine, call, stale, &c.

Its haunts are not certain, but various; any covert will serve its turn, and sometimes none at all.

The places partridges delight in most are corn fields, especially whilst the corn grows, for under that cover they shelter and breed; neither are those places unfrequented by them when the corn is cut, by reason of the grain they find there, and the covert or shelter of the wheat stubble. Here among the furrows, the clots, brambles, and long grass, they will hide both themselves and coveys, which are sometimes twenty or even thirty in a single covey.

When the winter season is arrived, and these stubble fields are ploughed up, or over-soiled with cattle, partridges resort into the upland meadows, and lodge in the dead grass, or fog under hedges amongst mole hills, or under the roots of trees; sometimes they resort to coppices and underwoods, especially if any corn-fields be adjacent, or where broom, brakes, fern, &c. offer an asylum.

In the harvest-time, when every field is full

P A R T R I D G E.

of men and cattle, you will find them by day in the fallow-fields adjoining the corn-fields, where they lie lurking till evening or morning, and then they feed among the sheaves of corn.

When you know their haunts, according to the situation of the country and season of the year, your next care must be to find them out in their haunts, which is done several ways. Some attempt it by the eye only; and this art can never be taught, but learned by frequent experience, distinguishing thereby the colour of the partridge from that of the earth, and how, and in what manner they lodge and couch together; by which means you may come near enough to them, they being a very lazy bird, and so unwilling to take the wing, that you may almost set your foot upon them before they will stir, provided you do not stand and gaze on them, but be in continual motion, otherwise they will spring up and fly away.

Another mode of discovering them is by going to their haunts very early in the morning, or at the close of the evening, which is called the clucking-time, and there listening for the calling of the cock-partridge, which is very loud and earnest, when after some few calls the hen will answer, and by this means they meet together, which you may know by their mutual rejoicing and chattering; upon hearing of which take your range about them, drawing nearer and nearer to the place where you heard them cluck in; casting your eye towards the furrows of the lands, and there you will soon find where the covey lies.

The best, surest, and easiest method of finding partridges is by the call, having first learned the true and natural notes of the partridge, knowing how to tune every note in its proper key, and applying them to their due times and seasons.

Being perfect herein, either mornings or evenings (all other times being improper), go to their haunts, and having secured yourself in some secret place where you may see and not be seen, listen a while if you can hear the partridges call; if you do, answer them again in the same notes, and as they change or double their notes, so must you in like manner; thus continue till they draw nearer and nearer to you: having them in your view, fall down on your back, and lie without motion, as if you were dead; by this means you may learn their whole number.

To take partridges with nets.—The nets for taking partridges must be every way like pheasant-nets, both in length and breadth, except that the meshes must be smaller; they should be made of the same thread, and dyed of the same colour.

Having found out the covey, draw forth your nets, and taking a large circumference, walk a good round pace with a careless eye, rather from than towards them, till you have trimmed your nets, and made them ready for the purpose; which done, you must draw in your circumference less and less, till you come within the length of your net, then pricking down a

stick about three feet long, fix one end of the line to the net, and make it fast in the earth as you walk about, for you must make no stop whatever: then letting the net slip out of your hands, spread it open as you go, and so carry and lay it all over the partridges.

If they should lie straggling, so that you cannot cover them all with one net, then draw forth another, and do with that as you did with the former; and so a third if there be occasion; having so done, rush in upon them suddenly, when being frightened they will fly up, and become entangled in the nets.

To take partridges with bird-lime.—Get the largest wheat-straws you can, and cut them off between knot and knot, and lime them with the strongest bird-lime. Go to the haunts of partridges and call; if you be answered, prick at some distance from you your lime-straws; in many cross-rows and ranks, cross the lands and furrows, taking in two or three lands at least, then lie close and call again, not ceasing till you have drawn them towards you, so that they be intercepted on the way by your limed straws, which they shall no sooner touch than they will be ensnared; and as they all run together like a brood of chickens, they will so besmear and daub each other, that very few will escape.

This way of taking partridges is only to be used in stubble-fields, from August till Christmas: but if you would take them in woods, pastures, or meadows, you must lime rods, the same as for pheasants, and stick them in the ground after the same manner.

To drive partridges.—This method of taking partridges is more agreeable than any other: it is conducted as follows:

Make an engine in the form of a horse, cut out of canvas, and stuff it with straw, or such like matter. With this artificial horse and your nets, go to the haunts of partridges, and having found out the covey, and pitched your nets below, proceed above, and taking the advantage of the wind, drive downward; and let your nets be pitched slope wise, and hovering. Then having your face covered with something green, or of a dark blue, and, putting the engine before you, stalk towards the partridges with a slow pace, raising them on their feet, but not their wings, and they will naturally run before you.

If they chance to run a by-way, or contrary to your purpose, then cross them with your engine, and by so facing them, they will run into that track you would have them: thus by a gentle slow pace you may make them run almost which way you will, and at last drive them effectually into your net.

To take partridges with a setting-dog.—There is no method of taking them so good as this. The setting dog is a lusty land-spaniel, taught by nature to hunt partridges more than any other animal whatever, running the fields over with such alacrity and nimbleness as if there was no limit to his fury and desire, and yet by art under such excellent command that in the very height of his career, by a hem or sound of his master's voice, he shall stand, gaze

about him, look in his master's face, and observe his directions, whether to proceed, stand still, or retire: nay, when he is even just upon his prey, that he may even take it up in his mouth, yet his obedience is so framed by art, that instantly he will either stand still or fall down flat on his belly, without daring to make any noise or motion till his master come to him, and then he will proceed in all things to follow his directions.

Having a dog thus qualified by art and nature, take him with you where partridges haunt, there cast off your dog, and by some word of encouragement that he is acquainted with engage him to range, but never too far from you; and see that he beats his ground justly and even, without casting about, or flying now here, now there, which the mettle of some will do, if not corrected and reprov'd; therefore, when you perceive this fault, you must instantly call him in with a hem, and so check him that he dare not do the like again for that day; so he will range afterwards with more temperance, frequently looking in his master's face, as if he would gather thence whether he did well or ill.

If in your dog's ranging you perceive him stop on a sudden, or stand still, you must then make up to him (for without doubt he hath set the partridge), and as soon as you come to him command him to go nearer to it; but if he go not, but either lies still or stands shaking his tail, and occasionally looks back, then cease from urging him farther, and take your circumference, walking fast, looking straight before the nose of the dog, and thereby see how the covey lies, whether close or straggling.

Then commanding the dog to lie still, draw forth your net, and prick one end to the ground, and spread your net all open, and so cover as many partridges as you can; which done, rush in with a noise and spring up the partridges, which will no sooner rise than they will be entangled in the net. And if you let go the old cock and hen, it will be a means to increase your sport.

Partridges are included in every act of parliament for the preservation of the game; and the penalty for killing a partridge by any unqualified person is five pounds: if such unqualified person kill a partridge, without having taken out an annual certificate from the clerk of the peace for the county in which he resides, (or where such partridge may have been killed,) he is then liable to a farther penalty of twenty pounds; making a forfeiture of twenty-five pounds in the whole.

If a person qualified to kill game in right of his property, (that is, by inheritance of a freehold landed estate of the clear yearly value of one hundred pounds per annum, or a leasehold of one hundred and fifty in his own, or his wife's right) do so at any one time without having taken out an annual certificate as aforesaid, and for which the sum of three guineas has been previously paid, he is then liable to a penalty of twenty pounds. And any person qualified, or unqualified, killing any partridge between the

first of February and the first of September, is liable to an additional penalty of five pounds to those already recited, for each offence.

Partridges, in their natural and infant state, accompany the hen in search of food, obey the cluck of the mother, and are protected by the clutch of her wings, in the same manner as chicken, and other domestic fowl. The hen is so instinctively attached to her young, that she will encounter every difficulty, and face death in every form, to insure their safety: although stupidly timid, and rendered almost insensible by her own fears, upon other occasions, yet great sagacity is observable in her endeavours to preserve her offspring. When they are very young, and unable to save themselves by flight; and in all cases of danger, when approached by that fatal enemy the dog; the hen will rise, and lead him on, by short flights, or rather hoverings, of twenty and thirty yards, but just above the ground, till having induced him to follow a sufficient distance from the seat of all her fears, she takes a long and more circuitous rout at her next flight; where, after finding she has completely baffled her pursuer, another effort brings her to her young in safety. When separated by danger (whether the approach of the dog and gun in the sporting season, or by other means) even to a great distance, they are invariably brought again together by the power of calling, which we have already noticed them to possess in so powerful a degree, as to insure a very expeditious recovery of each other.

PARTURIENT. *a.* (*parturiens*, Latin). About to bring forth.

PARTURITION. *s.* (from *parturio*, Lat.) The state of being about to bring forth (*Brown*).

PARTY. *s.* (*partie*, French.) 1. A number of persons confederated by similarity of designs or opinions in opposition to others; a faction (*Locke*). 2. One of two litigants (*Shakspeare*). 3. One concerned in any affair (*Shakspeare*). 4. Persons engaged against each other (*Dryden*). 5. Cause; side (*Dryden*). 6. A select assembly (*Pope*). 7. Particular person; a person distinct from, or opposed to, another (*Taylor*). 8. A detachment of soldiers.

PARTY-COLOURED. *a.* (*party and colour-ed.*) Having diversity of colours (*Dryden*).

PARTY-JURY. *s.* (In law.) A jury in some trials half foreigners and half natives.

PARTY-MAN. *s.* (*party and man.*) A factions person; an abettor of a party.

PARTY-WALL. *s.* (*party and wall.*) Wall that separates one house from the next.

By an act of 14 Geo. III. for better regulating buildings, and preventing mischiefs by fire within the cities of London and Westminster, and parishes within the bills of mortality, it is enacted in what manner buildings of all denominations shall be built; and surveyors are appointed to execute the directions of the act; the principal of which are as follows: buildings are of different rates, as, first, comprehending every church, chapel, or meet-

house; every building for distilling liquors, for making soap, melting tallow, dying, distilling turpentine, casting brass or iron, refining sugar, making glass, or chemical preparations, for sale; and all buildings, not being dwelling-houses, which exceed three clear stories above ground, or which are thirty-one feet high in either front; and dwelling-houses, exceeding the value of 850*l.* or more than nine squares on the ground plan. Second rate, warehouses whose height exceeds twenty-two feet, and is not thirty-one feet, whose value is more than 300*l.* and which are more than five squares on the ground plan. Third rate, warehouses not exceeding two clear stories, and more than one story, more than thirteen feet in height; or dwelling-houses which contain three and a half squares on the ground plan, and not

valued at more than 150*l.* Fourth rate, all warehouses under thirteen feet high, and one clear story; and all dwelling-houses under three and a half squares on the ground plan, and under the value of 150*l.* Those of the fifth rate may be of any dimensions, but must be sixteen feet from any other building, not in the same possession, &c. and four feet from any public way. Those of the sixth rate must be thirty feet from any other building not in the same possession, and eight feet from the public way: those may be made of any dimensions and materials. Those of the seventh rate are under no restraint, excepting that they must not be covered with pitch or tar, &c. The following table shews the dimensions of the party and external walls:

	first rate.		2d rate.		3d rate.		4th rate.		Bricks in length.
	Party.	External.	Party.	External.	Party.	External.	Party.	External.	
Foundation or footing	3 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	3	2 $\frac{1}{2}$	2	2 $\frac{1}{2}$	2
Basement	2 $\frac{1}{2}$	2	2 $\frac{1}{2}$	1 $\frac{1}{2}$	2	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Ground floor	2	2	2	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1	1	1	1
One pair floor	2	1 $\frac{1}{2}$	2	1	1	1	1	1	1
Second pair ditto	2	1 $\frac{1}{2}$	2	1	1	1	1	1	1
Third pair ditto	2	1 $\frac{1}{2}$	2	1	1	1	1	1	1
Through the roof	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1	1	1	1	1	1

No party wall is to be cut into without giving twenty-four hours notice to the surveyor, under penalty of 20*l.* on the master, and 50*s.* on the workman for every offence.

PARVIS. *s.* (French.) A church or church porch (*Bailey*).

PARVITUDE. *s.* (from *parvus*, Latin.) Littleness; minuteness: not used (*Glanville*).

PARVITY. *s.* (from *parvus*, Lat.) Littleness; minuteness: not used (*Ray*).

PARULIS. (from *παρε*, near, and *ουλον*, the gum.) A gum-boil.

PARUS. Titmouse. In zoology, a genus of the class aves, order passerres. Bill very entire, narrow, subcompressed, strong, hard, pointed, and covered at the base with bristles; tongue truncate, bristly at the end; toes divided to the origin, the hind one long and strong. Thirty-one species, scattered over the globe, of which eight are common to our own country. It is a very fertile tribe, laying eighteen or twenty eggs at one hatch: they feed on seeds, fruits and insects, and a few on flesh; most of them are fond of the brains of other birds, which they get at by cleaving the skull of such as they find dead. They are restless, bold, and cruel to birds less than themselves, and will attack such as are three times their own size. The following are chiefly worthy of notice.

1. *P. major.* Great titmouse. Head black; temples white; nape yellow. Bill, chin, and tail, black; back and wings olive; rump blue-grey; belly greenish-yellow, divided in the middle by a bed of black extending to the vent; quill-feathers dusky, edged partly with blue, partly with white; exterior sides of the outmost tail-

feathers white, of the others blueish, inner sides dusky; legs lead-colour. Inhabits Europe, Asia, and Africa, and a native of our own country; five and three-quarters inches long; frequents gardens, but builds in woods, and lays about ten eggs; does much mischief in gardens and orchards by picking off the tender buds of trees: eggs white with rusty spots.

There is another variety, olive-brown, beneath dirty-yellowish; head black; temples cinereous; bill forked, and crossed as in the *loxia curvirostra*: it has hence been called cross-billed titmouse. A specimen was once killed near Feversham, in Kent.

2. *P. caeruleus.* Blue titmouse. Quill-feathers blueish, the primaries white on the outer edge; front white; crown blue. Bill blackish; line from the bill to the eyes and one surrounding the temples black; crown black; back yellowish-green; tail blue, the middle-feathers longer; body beneath whitish-yellow; legs and claws black. Inhabits Europe; four and a half inches long; frequents gardens, like the last, and does much injury to fruit-trees by bruising the young buds in search of insects; breeds in holes of walls, and lays from twelve to fourteen small white eggs: a native of our own country.

3. *P. palustris.* Marsh titmouse. Head black; back cinereous; temples white. There are three other varieties.

c. Wings without the white bands.

γ. Body beneath, and band on the hind-head white.

δ. Crown black; nape yellowish.

Inhabits Europe, and found in our own

country, except the second, which is a native of Louisiana. Rather larger than the last.

4. *P. laudatus*. Long-tailed titmouse. Crown white; tail-longer than the body. Greater wing-coverts black, lesser brown, edged with rosy; four middle tail-feathers black, four edged with grey, the rest varied with black and white. Inhabits Europe; found in our own country, and as far north as Siberia; five and a half inches long; is very destructive to the trees in gardens; forms an oval nest with a hole near the upper end for admission; eggs from ten to seventeen, grey tinged with reddish.

5. *P. biarmicus*. Bearded titmouse. Rufous; crown hoary; tail longer than the body; head bearded; vent black. Inhabits Europe in marshy places, and found in such in our own country; six and a quarter inches long; suspends its nest between three reeds; eggs reddish-white with small red spots.

6. *P. pendulinus*. Penduline titmouse. Head ferruginous; ocular band black; quill and tail-feathers brown, edged on each side with ferruginous. Inhabits Europe as far as Siberia; four and a half inches long; frequents moist and marshy places, and builds a nest in the shape of a long purse, with an opening on one side, and attached to the end of some branch of a tree hanging over the water.

7. *P. amatorius*. Amorous titmouse. Blackish-blue; longitudinal spot on the middle of the wings half yellow and rufous. Inhabits northern Asia; five and a half inches long: is remarkable for the great affection each sex shows towards the other.

PARUTA (Paul), a nobleman of Venice, born in 1540, distinguished himself for his learning and knowledge as a statesman. He filled several great offices and undertook many embassies, which he performed with honour and probity. There are several works of his in Italian, such as *Notes upon Tacitus*; *A history of Venice*, from 1513 to 1551. He died in 1598.

PARYPATE HYPATON. (Greek.) Next the principal. In music, the appellation applied by the ancients to the second note of their lowest tetrachord; because it followed the first, or principal. This note corresponded with our C on the second space in the bass.

PARYS, a mountain in the isle of Anglesey, famous for a copper mine, which is not wrought in the common manner of subterranean mines, but, like a stone quarry, open to day; and the quantity of ore raised is prodigious. The purest part is exported raw to the smelting works at Swansea and other places: the most impure is first calcined and deprived of most of its sulphur on the spot. Quantities of nearly pure copper are obtained from the waters lodged beneath the bed of ore, by the intervention of iron. A lead ore, rich in silver, is also found in this mountain.

PAS. s. (French.) Precedence; right of going foremost.

Pas, a town of France, in the department of the Straits of Calais, 12 miles S.W. of Arras. Lon. 2. 40 E. Lat. 50. 9 N.

PAS DE CALAIS, or STRAITS OF CALAIS, a department of France, containing the late provinces of Artois and Boulonnois. Arras is the capital.

Pas (Antoine de), marquis of Feuquieres, a mareschal-de-camp, and an excellent French officer, but he was near 40 years of age before he distinguished himself. He was so greatly disliked by his soldiers, that it was said, "he was the most courageous man alive, since he slept every night in the midst of a hundred thousand enemies."

PASCAL (Blaise), a very eminent French mathematician and philosopher, and one of the greatest geniuses and best writers that country has produced. He was born at Clermont in Auvergne, in the year 1623. His father, Stephen Pascal, was president of the court of aids in his province: he was also a very learned man, an able mathematician, and a friend of Des Cartes. Having an extraordinary tenderness for this child, his only son, he quitted his province, and settled at Paris in 1631, that he might be quite at leisure to attend to his son's education, which he conducted himself, and young Pascal never had any other master. From his infancy Blaise gave proofs of a very extraordinary capacity. He was extremely inquisitive, desiring to know the reason of every thing; and when good reasons were not given him, he would seek for better; nor would he ever yield his assent but upon such as appeared to him well grounded. What is told of his manner of learning the mathematics, as well as the progress he quickly made in that science, seems almost miraculous. His father, perceiving in him an extraordinary inclination to reasoning, was afraid lest the knowledge of the mathematics might hinder his learning the languages, so necessary as a foundation to all sound learning. He therefore kept him as much as he could from all notions of geometry, locked up all his books of that kind, and refrained even from speaking of it in his presence. He could not however prevent his son from musing on that science; and one day in particular he surprised him at work with charcoal upon his chamber floor, and in the midst of figures. The father asked him what he was doing: I am searching, says Pascal, for such a thing; which was just the same as the 32d proposition of the 1st book of Euclid. He asked him then how he came to think of this: it was, said Blaise, because I found out such another thing; and so, going backward, and using the names of bar and round, he came at length to the definitions and axioms he had formed to himself. From this time he had full liberty to indulge his genius in mathematical pursuits. He understood Euclid's Elements as soon as he cast his eyes upon them. At sixteen years of age he wrote a treatise on Conic Sections, which was accounted a great effort of genius; and therefore it is no wonder that Des Cartes, who had been in Holland a long time, upon reading it, should choose to believe that M. Pascal the father was the real author of it. At nineteen he contrived an ad-

mirable arithmetical machine, which would have done credit as an invention to any man versed in science. About this time his health became impaired, so that he was obliged to suspend his labours for the space of four years. After this, having seen Torricelli's experiment respecting a vacuum and the weight of the air, he turned his thoughts towards these objects, and undertook several new experiments, by which he was fully convinced of the general pressure of the atmosphere; and from this discovery he drew many useful and important inferences. He composed also a large treatise, in which he fully explained this subject, and replied to all the objections that had been started against it. As he afterwards thought this work rather too prolix, and being fond of brevity and precision, he divided it into two small treatises, one of which he entitled, *A Dissertation on the Equilibrium of Fluids*: and the other, *An Essay on the Weight of the Atmosphere*. These labours procured Pascal also much reputation, that the greatest mathematicians and philosophers of the age proposed various questions to him, and consulted him respecting such difficulties as they could not resolve. Upon one of these occasions he discovered the solution of a problem proposed by Mersenne, which had baffled the penetration of all that had attempted it. This problem was to determine the curve described in the air by the nail of a coach-wheel, while the machine is in motion; which curve was thence called a *roulette*, but now commonly known by the name of *cycloid*. Pascal offered a reward of forty pistoles to any one who should give a satisfactory answer to it. No person having succeeded, he published his own at Paris; but under the name of A. d'Ettonville. This was the last work which he published in the mathematics; his infirmities, from a delicate constitution, though still young, now increasing so much, that he was under the necessity of renouncing severe study, and of living so recluse, that he scarcely admitted any person to see him.

After having thus laboured abundantly in mathematical and philosophical disquisitions, he forsook those studies and all human learning at once, to devote himself to acts of devotion and penance. He was not 24 years of age, when the reading some pious books had put him upon taking this resolution; and he became as great a devotee as any age has produced. He now gave himself up entirely to a state of prayer and mortification; and he had always in his thoughts these great maxims of renouncing all pleasure and all superfluity; and this he practised with rigour even in his illnesses, to which he was frequently subject, being of a very invalid habit of body.

Though Pascal had thus abstracted himself from the world, yet he could not forbear paying some attention to what was doing in it; and he even interested himself in the contest between the Jesuits and the Jansenists. Taking the side of the latter, he wrote his *Lettres Provinciales*, published in 1656, under the name of Louis de Montalte, making the for-

mer the subject of ridicule. "These letters," says Voltaire, "may be considered as a model of eloquence and humour. The best comedies of Moliere have not more wit than the first part of these letters; and the sublimity of the latter part of them is equal to any thing in Bossuet. It is true indeed that the whole book was built upon a false foundation; for the extravagant notions of a few Spanish and Flemish Jesuits were artfully ascribed to the whole society. Many absurdities might likewise have been discovered among the Dominican and Franciscan casuists; but this would not have answered the purpose; for the whole rallery was to be levelled only at the Jesuits. These letters were intended to prove, that the Jesuits had formed a design to corrupt mankind; a design which no sect or society ever had, or can have." Voltaire calls Pascal the first of their satirists; for Despréaux, says he, must be considered as only the second. In another place, speaking of this work of Pascal, he says, that "Examples of all the various species of eloquence are to be found in it. Though it has now been written almost 100 years, yet not a single word occurs in it, savouring of that vicissitude to which living languages are so subject. Here then we are to fix the epoch when our language may be said to have assumed a settled form. The bishop of Lucon, son of the celebrated Bossu, told me, that asking one day the bishop of Meaux what work he would covet most to be the author of, supposing his own performances set aside, Bossu replied, *The Provincial Letters*." These letters have been translated into all languages, and printed over and over again. Some have said that there were decrees of formal condemnation against them; and also that Pascal himself, in his last illness, detested them, and repented of having been a Jansenist: but both these particulars are false and without foundation. It was supposed that father Daniel was the anonymous author of a piece against them, entitled *The Dialogues of Cleander and Eudoxus*.

Pascal was but about 30 years of age when these letters were published; yet he was extremely infirm, and his disorders increasing soon after so much that he conceived his end fast approaching, he gave up all farther thoughts of literary composition. He resolved to spend the remainder of his days in retirement and pious meditation; and with this view he broke off all his former connections, changed his habitation, and spoke to no one, not even to his own servants, and hardly ever even admitted them into his room. He made his own bed, fetched his dinner from the kitchen, and carried back the plates and dishes in the evening; so that he employed his servants only to cook for him, to go to town, and to do such other things as he could not absolutely do himself. In his chamber nothing was to be seen but two or three chairs, a table, a bed, and a few books. It had no kind of ornament whatever; he had neither a carpet on the floor, nor curtains to his bed. But this did not prevent him from sometimes receiving visits; and when his

friends appeared surprised to see him thus without furniture, he replied, that he had what was necessary, and that any thing else would be a superfluity, unworthy of a wise man. He employed his time in prayer, and in reading the Scriptures; treasuring up such thoughts as this exercise inspired. Though his continual infirmities obliged him to use very delicate food, and though his servants employed the utmost care to provide only what was excellent, he never relished what he ate, and seemed quite indifferent whether they brought him good or bad. His indifference in this respect was so great, that though his taste was not vitiated, he forbade any sauce or ragout to be made for him which might excite his appetite.

Though Pascal had now given up intense study, and though he lived in the most temperate manner, his health continued to decline rapidly; and his disorders had so enfeebled his organs, that his reason became in some measure affected. He always imagined that he saw a deep abyss on one side of him, and he never would sit down till a chair was placed there, to secure him from the danger which he apprehended. At another time he fancied that he had a kind of vision or ecstasy; a memorandum of which he preserved during the remainder of his life on a bit of paper, put between the cloth and the lining of his coat, and which he always carried about him. After languishing for several years in this imbecile state of body and mind, M. Pascal died at Paris the 19th of August 1662, at 39 years of age.

In company, Pascal was distinguished by the amiableness of his behaviour; by great modesty; and by his easy, agreeable, and instructive conversation. He possessed a natural kind of eloquence, which was in a manner irresistible. The arguments he employed for the most part produced the effect which he proposed; and though his abilities intitled him to assume an air of superiority, he never displayed that haughty and imperious tone which may often be observed in men of shining talents. The philosophy of this extraordinary man consisted in renouncing all pleasure, and every superfluity. He not only denied himself the most common gratifications; but he took also without reluctance, and even with pleasure, either as nourishment or as medicine, whatever was disagreeable to the senses; and he every day retrenched some part of his dress, food, or other things, which he considered as not absolutely necessary. Towards the close of his life, he employed himself wholly in devout and moral reflections, writing down those which he deemed worthy of being preserved. The first bit of paper he could find was employed for this purpose; and he commonly set down only a few words of each sentence, as he wrote them merely for his own use. The scraps of paper upon which he had written these thoughts were found after his death filed upon different pieces of string, without any

order or connection; and being copied exactly as they were written, they were afterward arranged and published, under the title of *Pensées*, &c. or *Thoughts upon Religion and other Subjects*; being parts of a work he had intended against atheists and infidels, which has been much admired. After his death appeared also two other little tracts; the one intitled, *The Equilibrium of Fluids*; and the other *The Weight of the Mass of Air*.

The works of Pascal were collected in 5 volumes 8vo, and published at the Hague, and at Paris, in 1779. This edition of Pascal's works may be considered as the first published; at least the greater part of them were not before collected into one body, and some of them had remained only in manuscript. For this collection the public were indebted to the Abbé Bossu, and Pascal was deserving of such an editor. "This extraordinary man," says he, "inherited from nature all the powers of genius. He was a mathematician of the first rank, a profound reasoner, and a sublime and elegant writer. If we reflect, that in a very short life, oppressed by continual infirmities, he invented a curious arithmetical machine, the elements of the calculation of chances, and a method of resolving various problems, respecting the cycloid; that he fixed in an irrevocable manner the wavering opinions of the learned concerning the weight of the air; that he wrote one of the completest works existing in the French language; and that in his *Thoughts* there are passages the depth and beauty of which are incomparable—we can hardly believe that a greater genius ever existed in any age or nation. All those who had occasion to frequent his company in the ordinary commerce of the world acknowledged his superiority; but it excited no envy against him, as he was never fond of showing it. His conversation instructed, without making those who heard him sensible of their own inferiority; and he was remarkably indulgent towards the faults of others. It may be easily seen by his *Provincial Letters*, and by some of his other works, that he was born with a great fund of humour, which his infirmities could never entirely destroy. In company, he readily indulged in that harmless and delicate raillery which never gives offence, and which greatly tends to enliven conversation; but its principal object generally was of a moral nature. For example, ridiculing those authors who say, *my book, my commentary, my history*, they would do better (added he) to say, *our book, our commentary, our history*; since there are in them much more of other people's than their own."

The celebrated Bayle, speaking of this great man, says, an hundred volumes of sermons are not of so much avail as a simple account of the life of Pascal. His humility and his devotion mortified the libertines more than if they had been attacked by a dozen of missionaries. In a word, Bayle had so high an idea of this philosopher, that he calls him a paradox in the human species. "When we consider his cha-

racter (says he), we are almost inclined to doubt that he was born of a woman, like the man mentioned by Lucretius: *ut vir humana videatur stirpe creatus.*"

Voltaire, who thought it impossible he could do too much towards limiting the influence of christianity in the world, could not suffer so extraordinary and popular a book as Pascal's Thoughts to be circulated always in their original state. He therefore undertook to corrupt them in a way that exhibits one of the most singular specimens of literary artifice that has ever been imposed upon the world. This artifice consisted in publishing an edition of the Thoughts, with notes by Voltaire himself. In this edition he differently arranged, or rather disarranged the Thoughts themselves, so as to destroy much of their beauty and force. Some new passages were inserted, taken from manuscripts of Pascal to which he had access; and in the introduction of which he has taken care to blend some abominable things of his own invention, for the purpose of making Pascal appear as unprincipled a hy as himself; added to this, he also introduced into the body of the work, and under the running title of Pascal's Thoughts, a discourse intended to bring the immortality of the soul into question! The phraseology of Pascal, too, he has often changed; and various notes are added here and there, in order to make some passages appear laughable, others weak, and others absurd. If infidelity can make a man of genius stoop to such dirty work as this, what honest man must not shudder at the idea of becoming an infidel?

PASCALIA. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; seeds drupaceous, crowned with a toothed margin; calyx imbricate. One species, a native of Chili, with nearly simple erect stem; toothed, ovate, glabrous leaves; solitary, terminal, yellow flowers.

PASCHAL. *a.* (*pascal*, Fr. *paschalis*, Lat.) 1. Relating to the passover. 2. Relating to Easter.

PASEWALK, a town of Upper Saxony, in Interior Pomerania. Near it are some iron-works. It is situate on the Ucker, 21 miles W. of Stettin, and 66 S.S.E. of Stralsund. Lon. 13. 57 E. Lat. 53. 27 N.

PASH. *s.* (*paz*, Spanish.) A face (*Shakspeare*).

To PASH. *v. a.* (*perssen*, Dutch.) To strike; to crush (*Dryden*).

PASPALUM. In botany, a genus of the class triandria, order digynia. Calyx two-valved, orbicular; corol the size of the calyx; stigmas pencil-form. Fifteen species, natives of both the Indies and of America.

PASQUIN, a mutilated statue, seen at Rome, in a corner of the palace of the Ursini. It takes its name from a cobbler of that city, called Pasquin, famous for his sneers and gibes, and whose shop was the resort of a number of idle people, who diverted themselves with bantering folks as they passed by.

After Pasquin's death, as they were digging up the pavement before his shop, they found a statue of an ancient gladiator, well cut, but maimed, and half spoiled. This they set up, in the place where it was found, at the corner of the deceased Pasquin's shop; and, by common consent, called it by the name of the defunct.

From that time all satires and lampoons are ascribed to this figure, and are put in its mouth or pasted against it; as if they came from Pasquin *redivivus*. Pasquin usually addresses himself to Marforio, another statue in Rome; or Marforio to Pasquin, whom they then make reply.

The answers are usually very short, poignant, and unlucky. When Marforio is attacked, Pasquin comes to his assistance; and Pasquin is assisted by Marforio in his turn; i. e. the people make the statues speak just what they please.

PASQUINADE, or **PASQUIL**, is properly a satirical libel fastened to the statue of Pasquin.

Hence, by extension, the term becomes used for any satire, lampoon, or sneer upon the public, or upon the ruling powers.

To PASS. *v. n.* (*passer*, French.) 1. To go; to move from one place to another; to be progressive (*Shakspeare*). 2. To go forcibly; to make way (*Dryden*). 3. To make a change from one thing to another (*Temple*). 4. To vanish; to be lost (*Dryden*). 5. To go away progressively (*Locke*). 6. To be at an end; to be over (*Dryden*). 7. To die; to pass from the present life to another state (*Shakspeare*). 8. To be changed by regular gradation (*Arbutnot*). 9. To go beyond bounds; obsolete (*Shakspeare*). 10. To be in any state (*Ezekiel*). 11. To be enacted (*Clarendon*). 12. To be effected; to exist (*Hooker*). 13. To gain reception; to become current (*L'Estrange*). 14. To be practised artfully or successfully (*Shaks.*). 15. To be regarded as good or ill (*Atterbury*). 16. To occur; to be transacted (*Watts*). 17. To be done (*Taylor*). 18. To heed; to regard; not in use (*Shakspeare*). 19. To determine finally; to judge capitally (*Shakspeare*). 20. To be supremely excellent (*Underwood*). 21. To thrust; to make a push in fencing (*Dryden*). 22. To omit to play (*Prior*). 23. To go through the alimentary duct (*Arbutnot*). 24. To be in a tolerable state (*L'Estrange*). 25. To Pass away. To be lost; to glide off (*Locke*). 26. To Pass away. To vanish.

To PASS. *v. a.* 1. To go beyond (*Hay*). 2. To go through: as, *the horse passed the river*. 3. To spend; to live through (*Collier*). 4. To impart to any thing the power of moving (*Derham*). 5. To carry hastily (*Addison*). 6. To transfer to another proprietor (*Herb.*). 7. To strain; to percolate (*Bacon*). 8. To vent; to pronounce (*Watts*). 9. To utter ceremoniously (*Clarendon*). 10. To utter solemnly (*L'Estrange*). 11. To transmit; to procure to go (*Clarendon*). 12. To put an end to (*Sh.*). 13. To surpass; to excel (*Ezekiel*). 14. To

omit; to neglect (*Shakspeare*). 15. To transcend; to transgress (*Burnet*). 16. To admit; to allow (*Kings*). 17. To enact a law (*Swift*). 18. To impose fraudulently (*Dryden*). 19. To practise artfully; to make succeed (*L'Estrange*). 20. To send from one place to another: as, pass that beggar to his own parish. 21. To Pass away. To spend; to waste (*Ecclus.*). 22. To Pass by. To excuse; to forgive (*Til.*). 23. To Pass by. To neglect; to disregard (*Bacon*). 24. To Pass over. To omit; to let go unregarded (*Dryden*).

PASS. *s.* (from the verb.) 1. A narrow entrance; an avenue (*Shakspeare*). 2. Passage; road (*Ruleigh*). 3. A permission to go or come any where (*Shakspeare*). 4. An order by which vagrants or impotent persons are sent to their place of abode. 5. Push; thrust in fencing (*Sh.*). 6. State; condition (*Sidney*).

PASS, in a military sense, a strait and difficult passage, which shuts up the entrance into a country.

PASS; or PASSADE, in fencing, an advance or leap forward upon the enemy. Of these there are several kinds; as passes within, above, beneath, to the right, the left, and passes under the line, &c. The measure of the pass is when the swords are so near as that they may touch one another.

PASSABLE. *a.* (*passable*, Fr. from *pass*.) 1. Possible to be passed or travelled through or over (*Shakspeare*). 2. Supportable; tolerable; allowable (*Dryden*). 3. Capable of admission or reception (*Collier*). 4. Popular; well received (*Bacon*).

PASSACAGLIO. (*Ital.*) In music, a kind of chacone, but somewhat graver and more delicate than that air. See PASSACAILLE.

PASSACAILLE. (*French.*) A kind of chacone of a tender and slow movement. It is generally written in three crotchets, and begins with the third. There are, however, passacailles in common time beginning with the full bar, though they are very rare.

PASSADE, in fencing. See PASS.

PASSADE, in the manage, is a tread, or way, that a horse makes oftener than once upon the same extent of ground, passing and repassing from one end of its length to the other, which cannot be done without changing the hand, or turning and making a demi-tour at each of the extremities of the ground. Hence it comes that there are several sorts of passades, according to the different ways of turning, in order to part, or put on again and return upon the same piste or tread, which is called closing the passade.

PASSAGE, in the manage. To passage a horse, is to make him go upon a walk or trot upon two pistes or treads, between the two heels, and side-ways, so that his hips make a tract parallel to that made by his shoulders. It is but of late that passing upon a trot has been used, for formerly the word passage signified walking a horse upon two treads behind the two heels.

A horse is passaged upon two straight lines, along a wall or hedge: he is likewise passaged

on his own length upon volts, in going side-ways upon a circle, round a center, the semi-diameter being above his own length, so that he looks into the volt, and half his shoulders go before the croup. In all passing, the horse's outward fore-leg must cross or lap a great deal over the inward fore-leg, at every second time of marking. In a passage on a walk, and that on a trot, the motion of the horse is the same, only one is swifter than the other.

PASSAGE. *s.* (*passage*, French.) 1. Act of passing; travel; course; journey (*Raleigh*). 2. Road; way (*South*). 3. Entrance or exit; liberty to pass (*Shakspeare*). 4. The state of decay: not in use (*Shakspeare*). 5. Intellectual admittance; mental acceptance (*Digby*). 6. Occurrence; hap (*Shakspeare*). 7. Unsettled state; aptness by condition or nature to change the place of abode (*Temple*). 8. Incident; transaction (*Hayward*). 9. Management; conduct (*Davies*). 10. Part of a book; single place in a writing. *Endroit*, French (*Addison*).

PASSAGE. In stat. 4 Edward III. c. 7, this term is used for the hire a man pays for being transported over any sea or river. Various statutes of a local nature have been passed for regulating the passage of particular rivers. By a statute of Edward IV. the passage from Kent to Calais is restrained to Dover.

PASSAGE (Birds of), are such as only come to us at certain seasons, and then disappear again; being supposed to pass the sea to some other climate.

Among the birds of passage are the stork, swallow, nightingale, martin, woodcock, quail, hooded crow, cuckoo, wry-neck, several species of the pigeon and thrush, snipe, curlew, several species of sand-piper, long-legged plover, land-rail, several species of grebe, divers, terns, mergansers, many species of ducks, &c.

Mr. Pennant remarks, that every species of the genera of curlews, woodcocks, sand-pipers, and plovers, that forsake us in the spring, retire to Sweden, Poland, Prussia, Norway, and Lapland, to breed; and as soon as the young can fly, they return to us again; because the frosts which set in early in those countries deprive them of the means of subsistence; and the dryness and hardness of the ground, in general, during our summer, prevent them from penetrating the earth with their bills in search of worms, which are the natural food of these birds. Of the numerous species of migrating fowl, there are scarcely any that may not be traced to Lapland, a country of lakes, rivers, swamps, and alps, covered with thick and gloomy forests, that afford shelter during summer to these fowls, which in winter disperse over the greatest part of Europe. In those northern regions, by reason of the thickness of the woods, the ground remains moist and penetrable by the woodcocks, and other slender-billed fowl; and for the web-footed birds, the waters afford larvæ without number of the gnat. The days are long, and the light nights are favourable to their collecting this food: to which we may add, that mankind are

very sparingly scattered over that vast northern waste. *British Zoology*, vol. ii. Appendix. See MIGRATION, ORNITHOLOGY.

PASSALUS, in entomology, a tribe in the Fabrician system, belonging to the coleopterous genus *DERMESTES*, which see.

PASSANT, in heraldry, a term applied to a lion or other animal in a shield, appearing to walk leisurely: for most beasts, except lions, the trippant is frequently used instead of passant.

PASSAROWITZ, a town of Turkey in Europe, in Servia, remarkable for a peace concluded there, in 1718, between the emperor Charles VI. and Achmet III. It is situate near the river Morava, 33 miles E.S.E. of Belgrade, and 44 W. of Orsova. Lon. 21. 16 E. Lat. 45. 6 N.

PASSARVAN, a town of the island of Java, in the East Indies. Lon. 114. 15 E. Lat. 7. 0 S.

PASSAU, an ancient city of Bavaria, capital of a bishopric of the same name, with a fort. The houses are well built, and the cathedral is thought to be the finest in all Germany. It is divided into four parts, namely, the town of Passau Instadt, Illstadt, and the quarter in which is the bishop's palace. The first three are fortified, but the last is only a suburb. It is seated at the confluence of the Inn and Iltz, 62 miles E. by S. of Ratisbon, and 135 W. of Vienna. Lon. 13. 37 E. Lat. 48. 28 N.

PASSÉD. The pret. and part. of *pass*.

PASSENGER. *s.* (*passager*, French.) 1. A traveller; one who is upon the road; a wayfarer (*Spenser*). 2. One who hires in any vehicle the liberty of travelling (*Sidney*).

PASSENGER FALCON. *s.* A kind of migratory hawk (*Ainsworth*).

PASSER. *s.* (from *pass*.) One who passes; one that is upon the road (*Carew*).

PASSERES. In zoology, the name of the sixth order of the Linnéan class aves: thus ordinarily characterised. Bill conic, pointed; legs formed for hopping; toes slender; divided; body slender; flesh of such as feed on grain pure, of such as feed on insects impure; nest formed with wonderful art. They live chiefly in trees and hedges, are monogamous, vocal, and feed their young by thrusting the food down their throats. The order includes seventeen genera, for which see the article ZOOLOGY.

PASSERINA. In botany, a genus of the class octandria, order monogynia. Calyxless; corol four-cleft; stamens seated on the tube; nut one, covered with a bark. Sixteen species; chiefly natives of the Cape: a few of the south of Europe.

PASSERO (Cape), anciently called Pachinus, the most southerly point of Sicily. It is a barren island, about a mile round, separated from the rest of Sicily by a strait, half a mile broad. It has a fort, to protect the country from the incursions of the Barbary corsairs. Lon. 15. 22 E. Lat. 36. 35 N.

PASSIBILITY. *s.* (*passibilité*, Fr. from *passible*.) Quality of receiving impressions from external agents (*Hakewill*).

PASSIBLE. *a.* (*passible*, Fr. *passibilis*, Lat.) Susceptible of impressions from external agents (*Hooker*).

PASSIBLENESS. *s.* Quality of receiving impressions from external agents (*Brerewood*).

PASSIFLORA. Passion-flower. Love in a mist. In botany, a genus of the class monadelphia, order pentandria. Calyx five-parted; petals five, inserted into the calyx; nectary a crown of filaments surrounding the stamens and styles; styles three; gourd pedicelled. Forty-six species, all natives of the West Indies or South America. They may be thus divided into tribes.

A. Leaves undivided.

B. Leaves two-lobed.

C. Leaves three-lobed.

D. Leaves many-cleft.

The following are cultivated.

1. *P. cærulea*. Common or blue passion-flower.

2. *P. incarnata*. Rose-coloured passion-flower.

3. *P. lutea*. Yellow passion-flower.

4. *P. serratifolia*. Notch-leaved passion-flower.

5. *P. maliformis*. Apple-fruited passion-flower.

6. *P. quadrangularis*. Square-stalked passion-flower.

7. *P. alata*. Wing-stalked passion-flower.

8. *P. laurifolia*. Bay-leaved passion-flower, or water melon.

9. *P. multiflora*. Many-flowered passion-flower.

10. *P. rubra*. Red-fruited passion-flower.

11. *P. muracinja*. Moon-shaped passion-flower.

12. *P. vespertilis*. Bat-winged passion-flower.

13. *P. rotundifolia*. Round-leaved passion-flower.

14. *P. ciliata*. Ciliated passion-flower.

15. *P. suberosa*. Cork-barked passion-flower.

16. *P. nolosericica*. Silky-leaved passion-flower.

17. *P. glauca*. Glauous-leaved passion-flower.

18. *P. minima*. Dwarf passion-flower.

As all the species are natives of warm climates, there are few of them, except *P. cærulea*, that will succeed in the open air in our own country; and even this requires a warm situation, and often loses its branches in severe winter.

The fruit of the *P. maliformis* is esteemed a delicacy in the West Indies, where it is served up among the deserts of the islands. The fruit of *P. laurifolia* has a delicious smell and flavour, and is excellent in quenching thirst, abating heat of the stomach, increasing the appetite, recruiting the spirits, and allaying heat in burning fevers.

PASSING. *participial a.* (from *pass*.) 1. Supreme; surpassing others; eminent (*Fairfax*). 2. It is used adverbially to enforce the meaning of another word. Exceeding; as, *passing fair* (*Shakspeare*).

PA'SSINGBELL. *s.* (*passing* and *bell*.) The bell which rings at the hour of departure, to attend prayers for the passing soul: it is often used for the bell which rings immediately after death (*Daniel. Swift*).

PASSING-NOTES, those notes in the melody, bass, or other parts of a composition, which do not represent the sounds of the chord or harmony, but which are only introduced for the purpose of ornamenting and enriching the effect.

PASSING-SHAKE, a short trill, made *en passant*, in flowing passages of quavers or semi-quavers, without breaking the time, or interrupting the natural course of the melody.

These, and indeed most other adventitious graces, must be introduced with great caution and discretion, as well as with much delicacy and propriety of execution.

PASSION. *s.* (*passion*, Fr. *passio*, Latin.)

1. Any effect caused by external agency (*Loc.*).
2. Susceptibility of effect from external action (*Bacon*).
3. Violent commotion of the mind (*Milton*).
4. Anger (*Watts*).
5. Zeal; ardour (*Addison*).
6. Love (*Dryden*).
7. Eagerness (*Swift*).
8. Emphatically. The last suffering of the Redeemer of the world (*Acts*).

To **PA'SSION**, *v. n.* (*passionner*, French.) To be extremely agitated; to express great commotion of mind: obsolete (*Shakspeare*).

PASSION (*passio*, *πάθος*, or *πάθημα*) is applied to the different motions and agitations of the soul, according to the different objects that present themselves to the senses. In propriety all those motions whereby the soul is carried towards anything; as love, ambition, revenge, &c. are rather actions than passions.

Those motions whereby the soul finds itself interrupted in its actions, as grief, &c. are the only real passions.

We find various modifications and impressions of pleasure and pain inseparably annexed, by an established law of nature, to the several judgments we form concerning good and evil; these judgments, with their respective modifications of pleasure or pain annexed, according to the various appearances and relations of the object considered, either as good or evil, present or absent, certain or uncertain, probable or improbable, possible or impossible, and affecting the machine in a certain manner peculiar to such modifications, make what we call the passions.

How, or by what means, this mutual action and communication between soul and body is effected, we are in a great measure ignorant; we have but very obscure and faint notions of any thing prior, or more simple to resolve it into, except the immediate will and agency of the first cause itself.

Malebranche defines the passions to be all those emotions naturally arising in the soul, on occasion of extraordinary motions of the animal spirits, and the blood. In opposition to those motions of the soul which are common to us with pure intelligences, and which he calls natural inclinations.

Though the passions be inseparable from inclinations; and though a man be only capable of sensible love or hatred, because he is capable of spiritual ones; yet does it appear just in that author to distinguish between them. Passions are much stronger and warmer than inclinations; their objects also are different, and so are their causes: in

truth, passions and inclinations differ just as much as sense and imagination.

An ingenious writer has accurately distinguished between our affections and our passions; the former, which we apply indiscriminately to all reasonable beings, may most properly signify the desires and inclinations, founded in the reasonable nature itself, and essential to it; such as self-love, benevolence, and the love of truth. These, when aided and strengthened by additional instinctive determinations, are, properly, passions. Those tendencies within us that are merely arbitrary and instinctive, such as hunger and thirst, and the desires between the sexes, we commonly call appetites or passions, indifferently, but seldom or never affections. *Price's Rev. of Morals*, p. 125, &c.

Passion, says another excellent writer, is a kind of medium between a simple affection of the mind and the appetites and sensations of the body. Passion is an affection of the mind which distinguishes it from the appetites of the body, hunger and thirst, and from bodily sensations; and it is attended with a peculiar and extraordinary emotion of the animal spirits, by which it is distinguished from pure affection, and from the several sensations; in all which, though there be some motion of the blood and spirits, yet that motion is natural and regular; whereas in the agitation occasioned by the passions, the spirits are moved after a more vehement and tumultuous manner. *Grove's System of Moral Philosophy*, vol. i. chap. 7.

But Dr. Cogan, a recent very able writer on this interesting branch of enquiry, in giving a general view of the subject, says, by passions, emotions, and affections, we understand those stronger or weaker feelings, with their correspondent effects upon the system, which are excited within us by the perception or contemplation of certain qualities, which belong, or are supposed to belong to the objects of our attention; and which in some respect or other appear interesting to us. In all cases, when the violence of the emotion is not too powerful for the animal œconomy, the feelings or sensations excited are pleasant or unpleasant, according to the nature of the exciting cause, the ideas entertained of it, or the intenseness with which the mind is struck by it. These feelings differ in degrees of strength, according to the apparent importance of their cause; according to certain peculiarities of temperament; and also according to the manner in which the influential qualities are presented to the mind.

One or other of the three terms, passion, emotion, affection, is always employed to express the sensible effects which objects, or ideas concerning them, have upon the mind; but they are so frequently employed in a vague and indeterminate manner, that some difficulty attends the attempt to restore them to their precise and discriminating significations.

The word passion is thus rendered subject to several peculiarities in the application of it. Sometimes it is used in a generic sense, as expressive of every impression made upon the mind. When we speak of the passions in general, or of a treatise on the passions, we mean not to express the stronger impressions alone; the mildest affections are also included: and if we denominate any one to be a person of strong passions, we mean that he is subject to violent transports of joy, or grief, or anger, &c. indiscriminately. In one instance the word is emphatically employed to express suffering; as our Saviour's passion: in another it indicates anger exclusively; thus when it is said of any one that he

PASSION.

is in a passion, it is universally understood that he is very angry. The term passion, and its adverb passionately, often express a very strong predilection for any pursuit, or object of taste; a kind of enthusiastic fondness for any thing. Thus we remark of one person that he has a passion for music, or that he is passionately fond of music; of another that he is passionately fond of painting, &c.

In a sense similar to this is the word also applied to every propensity which operates strongly and permanently upon the mind; as the selfish passions, the generous passions. Yet when we mean to particularize any of these, a different law of phraseology is observed. The word passion is appropriated by the evil propensities which are uniformly operative. Thus we do not say the affection of pride, or of avarice, but the passion. The term affection on the other hand is appropriated by the virtuous propensities; as the social, friendly, parental, filial, affections, &c. though philosophically considered, the relation they bear to the state and workings of the mind is perfectly analogous.

Nor is this capricious latitude of expression confined to common language, where accuracy is not always to be expected. It is also obvious among philosophers themselves; so that scarcely two authors who have written upon the subject of the passions are agreed in their ideas of the terms they employ. Hence it will not be expected that we should dwell long upon them, in this place; we shall, therefore, refer to the individual articles FEAR, GRIEF, JOY, LOVE, &c. in this work, and for more complete information to Dr. Cogan's very ingenious treatise already quoted.

With regard to the external signs of the passions, we may remark with Lord Kames, that manifold and admirable are the purposes to which they are made subservient by the Author of our nature.

1. The signs of internal agitation displayed externally to every spectator, tend to fix the signification of many words.

2. Society among individuals is greatly promoted by that universal language. Looks and gestures give direct access to the heart; and lead us to select, with tolerable accuracy, the persons who are worthy of our confidence. It is surprising how quickly, and for the most part how correctly, we judge of character from external appearance.

3. After social intercourse is commenced, these external signs, which diffuse through a whole assembly the feelings of each individual, contribute above all other means to improve the social affections. Language, no doubt, is the most comprehensive vehicle for communicating emotions: but in expedition, as well as in power of conviction, it falls short of the signs under consideration; the involuntary signs especially, which are incapable of deceit. Where the countenance, the tones, the gestures, the actions, join with the words in communicating emotions, these united have a force irresistible. Thus all the pleasant emotions of the human heart, with all the social and virtuous affections, are, by means of these external signs, not only perceived but felt. By this admirable contrivance, conversation becomes that lively and animating amusement, without which life would at best be insipid: one joyful countenance spreads cheerfulness instantaneously through a multitude of spectators.

4. Dissocial passions, being hurtful by prompting violence and mischief, are noted by the most conspicuous external signs, in order to put us upon our guard: thus anger and revenge, especially when sudden, display themselves on the countenance in

legible characters. The external signs, again, of every passion that threatens danger raise in us the passion of fear; which frequently operating without reason or reflection, moves us by a sudden impulse to avoid the impending danger.

5. These external signs are remarkably subservient to morality. A painful passion, being accompanied with disagreeable external signs, must produce in every spectator a painful emotion: but then, if the passion be social, the emotion it produces is attractive, and connects the spectator with the person who suffers. Dissocial passions only are productive of repulsive emotions, involving the spectator's aversion, and frequently his indignation. This artful contrivance makes us cling to the virtuous, and abhor the wicked.

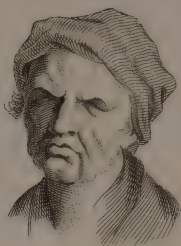
6. Of all the external signs of passion, those of affliction or distress are the most illustrious with respect to a final cause, and deservedly merit a place of distinction. They are illustrious by the singularity of their contrivance; and also by inspiring sympathy, a passion to which human society is indebted for its greatest blessing, that of providing relief for the distressed. A subject so interesting deserves a leisurely and attentive examination. The conformity of the nature of man to his external circumstances is in every particular wonderful; his nature makes him prone to society; and society is necessary to his well-being, because in a solitary state he is a helpless being, destitute of support, and in his distresses destitute of relief: but mental support, the shining attribute of society, is of too great moment to be left dependent upon cool reason; it is ordered more wisely, and with greater conformity to the analogy of nature, that it should be enforced even instinctively by the passion of sympathy. Here sympathy makes a capital figure, and contributes more than any other means to make life easy and comfortable. But however essential the sympathy of others may be to our well-being, one beforehand would not readily conceive how it could be raised by external signs of distress: for, considering the analogy of nature, if these signs be agreeable, they must give birth to a pleasant emotion leading every beholder to be pleased with human woes: if disagreeable, as they undoubtedly are, ought they not naturally to repel the spectator from them, in order to be relieved from pain? Such would be the reasoning beforehand, and such would be the effect were man purely a selfish being. But the benevolence of our nature gives a very different direction to the painful passion of sympathy, and to the desire involved in it: instead of avoiding distress, we fly to it in order to afford relief; and our sympathy cannot be otherwise gratified than by giving all the succour in our power. Thus external signs of distress, though disagreeable, are attractive: and the sympathy they inspire is a powerful cause, impelling us to afford relief even to a stranger, as if he were our friend or relation.

It is a noted observation, that the deepest tragedies are the most crowded: which in an overly view will be thought an unaccountable bias in human nature. Love of novelty, desire of occupation, beauty of action, make us fond of theatrical representations; and when once engaged, we must follow the story to the conclusion, whatever distress it may create. But we generally become wise by experience; and when we foresee what pain we shall suffer during the course of the representation, is it not surprising that persons of reflection do not avoid such spectacles altogether? And yet one who has scarce recovered from the distress of a

Sadness.



Weeping.



Compassion.



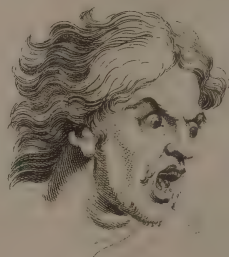
Scorn.



Horror.



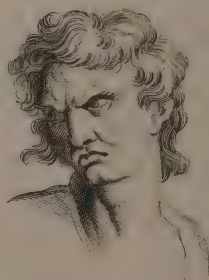
Terror or Fright.



Anger.



Hatred or Jealousy.



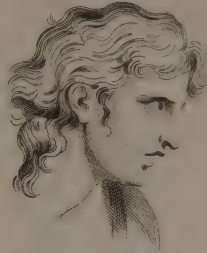
Despair.



Admiration.



Attention.



Veneration.



Admiration with Astonishment.

Rapture.



Joy with Tranquillity.



Desire.



Laughter.



Simple Bodily Pain.



Acute Pain.



deep tragedy, resolves coolly and deliberately to go to the very next, without the slightest obstruction from self-love. The whole mystery is explained by a single observation: that sympathy, though painful, is attractive; and attaches us to an object in distress, instead of prompting us to fly from it. And by this curious mechanism it is, that persons of any degree of sensibility are attracted by affliction still more than by joy.

PASSIONS, in painting, are the external expressions of the different dispositions and affections of the mind; but particularly their different effects upon the several features of the face: for though the arms, and indeed every part of the body, serve likewise, by their quick, languid, and variously diversified motions, to express the passions of the soul; yet, in painting, this difference is most conspicuous in the face.

As we have given engravings of Le Brun's drawings of the passions, we shall here subjoin the account which he has given of each of these heads. See plates 127 and 128.

1. The effects of *attention* are, to make the eye-brows sink and approach the sides of the nose; to turn the eye-balls toward the object that causes it; to open the mouth, and especially the upper part; to decline the head a little, and fix it without any other remarkable alteration.

2. *Admiration* causes but little agitation in the mind, and therefore alters but very little the parts of the face; nevertheless the eye-brow rises; the eye opens a little more than ordinary; the eye-ball placed equally between the eye-lids appears fixed on the object; the mouth half opens; and makes no sensible alteration in the cheeks.

3. The motions that accompany *admiration with astonishment* are hardly different from those of simple admiration, only they are more lively and stronger marked; the eye-brows more elevated; the eyes more open; the eye-ball farther from the lower eye-lid, and more steadily fixed; the mouth is more open, and all the parts in a much stronger emotion.

4. *Admiration* begets esteem, and this produces *veneration*, which, when it has for its object something divine or beyond our comprehension, makes the face decline, and the eye-brows bent down; the eyes are almost shut and fixed; the mouth is shut. These motions are gentle, and produce but little alterations in the other parts.

5. Although *rapture* has the same object as *veneration*, only considered in a different manner, its motions are not the same; the head inclines to the left side; the eye-balls and eye-brows rise directly up; the mouth half opens, and the two corners are also a little turned up: the other parts remain in their natural state.

6. The passion of *desire* brings the eye-brows close together and forwards toward the eyes, which are more open than ordinary; the eye-ball is inflamed, and places itself in the middle of the eye; the nostrils rise up and are contracted towards the eyes; the mouth half opens, and the spirits being in motion give a lively glowing colour.

7. Very little alteration is remarked in the face of those that feel within themselves the *sweetness of joy*, or *joy with tranquillity*. The forehead is serene; the eye-brow without motion, elevated in the middle; the eye pretty open and with a laughing air; the eye-ball lively and shining; the corners of the mouth turn up a little; the complexion is lively; the cheeks and lips are red.

8. *Laughter*, which is produced by joy mixed with surprise, makes the eye-brows rise towards the middle of the eye, and bend towards the sides

of the nose; the eyes are almost shut, and sometimes appear wet, or shed tears, which make no alteration in the face; the mouth half open shows the teeth; the corners of the mouth drawn back cause a wrinkle in the cheeks, which appear so swelled as to hide the eyes in some measure; the nostrils are open, and all the face is of a red colour.

9. *Acute pain* makes the eye-brows approach one another, and rise towards the middle; the eye-ball is hid under the eye-brows; the nostrils rise and make a wrinkle in the cheeks; the mouth half opens and draws back: all the parts of the face are agitated in proportion to the violence of the pain.

10. *Simple bodily pain* produces proportionally the same motions as the last, but not so strong. The eye-brows do not approach and rise so much; the eye-ball appears fixed on some object; the nostrils rise, but the wrinkles in the cheeks are less perceivable; the lips are further asunder towards the middle, and the mouth is half open.

11. The dejection that is produced by *sadness* makes the eye-brows rise towards the middle of the forehead more than towards the cheeks; the eye-ball appears full of perturbation; the white of the eye is yellow; the eye-lids are drawn down, and a little swelled; all about the eyes is livid; the nostrils are drawn downward; the mouth is half open, and the corners are drawn down; the head carelessly leaning on one of the shoulders: the face is of a lead colour; the lips pale.

12. The alterations that *weeping* occasions are strongly marked. The eye-brows sink down towards the middle of the forehead; the eyes are almost closed, wet, and drawn down towards the cheeks; the nostrils swelled; the muscles and veins of the forehead appear; the mouth is shut, and the sides of it are drawn down, making wrinkles on the cheeks: the under lip pushed out, presses the upper one: all the face is wrinkled and contracted; its colour is red, especially about the eye-brows, the eyes, the nose, and the cheeks.

13. The lively attention to the misfortunes of another, which is called *compassion*, causes the eye-brows to sink towards the middle of the forehead; the eye-ball to be fixed upon the object; the sides of the nostrils next the nose to be a little elevated, making wrinkles in the cheeks; the mouth to be open; the upper lip to be lifted up and thrust forwards; the muscles and all the parts of the face sinking down and turning towards the object which excites the passion.

14. The motions of *scorn* are lively and strong. The forehead is wrinkled; the eye-brow is knit; the side of it next the nose sinks down, and the other side rises very much; the eye is very open, and the eye-ball is in the middle; the nostrils rise, and draw towards the eyes, and make wrinkles in the cheeks; the mouth shuts, its sides sinking down, and the under lip is pushed out beyond the upper one.

15. An object despised sometimes causes *horror*, and then the eye-brow knits, and sinks a great deal more. The eye-ball, placed at the bottom of the eye, is half covered by the lower eye-lid; the mouth is half open, but closer in the middle than the sides, which being drawn back, makes wrinkles in the cheeks; the face grows pale, and the eyes become livid; the muscles and the veins are marked.

16. The violence of *terror* or *fright* alters all the parts of the face; the eye-brow rises in the middle; its muscles are marked, swelled, pressed one against the other, and sunk towards the nose,

which draws up as well as the nostrils; the eyes are very open; the upper eye-lid is hid under the eye-brow; the white of the eye is encompassed with red; the eye-ball fixes toward the lower part of the eye; the lower part of the eye-lid swells and becomes livid; the muscles of the nose and cheeks swell, and these last terminate in a point toward the sides of the nostrils; the mouth is very open, and its corners very apparent; the muscles and veins of the neck stretched; the hair stands on end; the colour of the face, that is, the end of the nose, the lips, the ears, and round the eyes, is pale and livid; and all ought to be strongly marked.

17. The effects of *anger* show its nature. The eyes become red and inflamed; the eye-ball is staring and sparkling; the eye-brows are sometimes elevated and sometimes sunk down equally; the forehead is very much wrinkled, with wrinkles between the eyes; the nostrils are open and enlarged; the lips pressing against one another, the under one rising over the upper one leaves the corners of the mouth a little open, making a cruel and disdainful grin.

18. *Hatred or jealousy* wrinkles the forehead; the eye-brows are sunk down and knit; the eye-ball is half hid under the eye-brows, which turn towards the object; it should appear full of fire, as well as the white of the eye and the eye-lid; the nostrils are pale, open, more marked than ordinary, and drawn backward so as to make wrinkles in the cheeks; the mouth is so shut as to show the teeth are closed; the corners of the mouth are drawn back and very much sunk; the muscles of the jaw appear sunk; the colour of the face is partly inflamed and partly yellowish; the lips pale or livid.

19. As *despair* is extreme, its motions are so likewise; the forehead wrinkles from the top to the bottom; the eye-brows bend down over the eyes, and press one another on the sides of the nose: the eye seems to be on fire, and full of blood; the eye-ball is disturbed, hid under the eye-brow, sparkling and unfixed; the eye-lid is swelled and livid; the nostrils are large, open, and lifted up; the end of the nose sinks down; the muscles, tendons, and veins are swelled and stretched; the upper part of the cheeks is large, marked, and narrow towards the jaw; the mouth drawn backwards is more open at the sides than in the middle; the lower lip is large and turned out; they gnash their teeth; they foam; they bite their lips, which are pale; as is the rest of the face; the hair is straight, and stands on end.

Other French writers have given instructions respecting the expression of the passions, differing much from those of Le Brun. All of them whom we have consulted make so many divisions and subdivisions of passions, that a philosopher cannot follow them in metaphysical theory, nor a painter exhibit their effects upon canvas. Nature therefore must be his guide, particularly in treating those very minute and almost imperceptible differences, by which, however, things very different from each other are often expressed. This is particularly the case with regard to the passions of laughing and crying; as in these, however contrary, the muscles of the face operate nearly in the same manner. As the famous Pietro de Cortona was one day finishing the face of a crying child in a representation of the iron age, with which he was adorning the floor called hot-bath in the royal palace of Pitti, Ferdinand II. who happened to be looking over him for his amusement, could not forbear expressing his approbation, by

crying out, "Oh how well that child cries!" To whom the artist: "Has your majesty a mind to see how easy it is to make children laugh? Behold, I'll prove it in an instant." And taking up his pencil, by giving the contour of the mouth a concave turn downwards, instead of the convex upwards which it before had, and with little or no alteration in any other part of the face, he made the child, who a little before seemed ready to burst its heart with crying, appear in equal danger of bursting its sides with immoderate laughter; and then, by restoring the altered features to their former position, he soon set the child a crying again. See farther, The Anatomy of Expression in Painting, by Charles Bell.

PASSION-FLOWER. See PASSIFLORA.

PASSION-WEEK, the week immediately preceding the festival of Easter; so called, because in that week our Saviour's passion and death happened. The Thursday of this week is called Maunday Thursday; the Friday, Good-Friday; and the Saturday, the Great Sabbath.

PA'SSIONATE. *a.* (*passionné*, French.)

1. Moved by passion; feeling or expressing great commotion of mind (*Clarendon*). 2. Easily moved to anger (*Prior*).

To PA'SSIONATE. *v. n.* (from *passion*.)

An old word, now obsolete. 1. To affect with passion (*Spenser*). 2. To express passionately (*Shakespeare*).

PA'SSIONATELY. *ad.* (from *passionate*.)

1. With passion; with desire, love, or hatred; with great commotion of mind (*South*). 2. Angrily (*Locke*).

PA'SSIONATENESS. *s.* (from *passionate*.)

1. State of being subject to passion. 2. Vehemence of mind (*Boyle*).

PA'SSIVE. *a.* (*passif*, Fr. *passivus*, Latin.)

1. Receiving impression from some external agent (*South*). 2. Unresisting; not opposing (*Pope*). 3. Suffering; not acting. 4. (In grammar.) A verb *passive* is that which signifies passion or the effect of action: as, *doceor*, I am taught (*Clarke*).

PA'SSIVELY. *ad.* (from *passive*.) With a passive nature (*Dryden*).

PA'SSIVENESS. *s.* (from *passive*.)

1. Quality of receiving impression from external agents. 2. Passibility; power of suffering. (*D. of Piety*). 3. Patience; calmness (*Fell*).

PASSIVITY. *s.* (from *passive*.) Passiveness.

An innovated word (*Cheyne*).

PASSOVER, *פסחא*, a solemn feast, celebrated among the Jews, on the fourteenth day of the moon next after the vernal equinox.

This feast was called, by the ancient Latins and Greeks, *pascha*, not from *פסח*, I suffer, as Chrysostom, Irenæus, and Tertullian imagine, but from the Hebrew *פסח* *pesahh*, passage, leap; the design of the feast being to commemorate the destroying angel's passing over the houses of the Israelites, when he entered in, and destroyed the first-born in those of the Egyptians. Exod. xii. 27. Many erroneously imagine, that it was in memory of their passing the Red Sea that the passover was instituted; though it is certain the feast

was held, and had its name, before the Israelites took a step of their way out of Egypt, and consequently several days before their passing the Red Sea.

Besides the passover observed on the fourteenth of the first month, there was a second passover held on the fourteenth of the second month after the equinox, instituted by God in favour of travellers, and sick persons, who could not attend at the first, nor be at Jerusalem on the day.

The Greeks, and even some of the catholic doctors, from the thirteenth, eighteenth, and nineteenth chapters of St. John, take occasion to conclude, that Jesus anticipated the day marked for the passover in the law; but the authority of three evangelists seems to evince the contrary. See Whitby's Dissertation on this subject, in an appendix to the fourteenth chapter of St. Mark.

F. Lamy is of opinion, that he did not attend at the passover the last year of his life; which sentiment has drawn upon him abundance of opposers. F. Hardouin maintains, that the Galileans celebrated the passover on one day, and the Jews on another.

PASSOVER denotes also the sacrifice killed.

PASS-PAROLE, a command given in the head of an army, and thence communicated to the rear, by passing it from mouth to mouth.

PASS-PAR-TOUT, a master-key; or key that opens indifferently several locks belonging to the same lodge or apartment.

PASSPORT, a licence or letter from a prince or governor, granting liberty and safe-conduct to travel, enter, and go out of, his territories, freely, and without molestation. The passport is properly given to friends, and the safe-conduct to enemies.

The violation of safe-conducts, or passports, expressly granted by the king or his ambassadors to the subjects of a foreign power in time of mutual war, or committing acts of hostility against such as are in amity, league, or truce with us, who are here under a general implied safe-conduct, are breaches of the public faith, without which there can be no intercourse or commerce between one nation and another; and such offences may, according to the writers upon the law of nations, be a just ground of a national war. And it is enacted by the statute 31 Henry VI. c. 4. now in force, that if any of the king's subjects attempt, or offend, upon the sea, or in any port within the king's obeysance, or against any stranger in amity, league, or truce, or under safe-conduct, and especially by attacking his person, or spoiling him, or robbing him of his goods; the lord chancellor, with any of the justices of either the king's bench or common pleas, may cause full restitution and amends to be made to the party injured.

Pasquier takes passport to have been introduced for passe-par-tout. Balzac mentions a very honourable passport given by an emperor to a philosopher in these terms: "If there be any one on land, or sea, hardy enough to molest Potamon, let him consider whether he be strong enough to wage war with Cæsar."

PASSPORT is also used for a licence granted by a prince for the importing or exporting merchandizes, moveables, &c. without paying the duties.

Merchants sometimes procure such passports for certain kinds of commodities; and they are always given to ambassadors and ministers, for their baggage, equipage, &c.

PASSPORT is also a licence obtained for the importing or exporting of merchandizes deemed contraband, and declared such by tariffs, &c. as gold, silver, precious stones, ammunition of war, horses, corn, wool, &c. upon paying duties.

PASSY, a village of France, in the department of Paris, near the town of St. Denys. Here is a considerable manufacture for speedily bleaching cotton and linen cloth.

PAST. *part. a.* (from *pass.*) 1. Not present; not to come (*Swift*). 2. Spent; gone through; undergone (*Pope*).

PAST. *s.* Elliptically used for past time (*Fenton*).

PAST. *pre.* 1. Beyond in time: *it is past the time of history* (*Hebrews*). 2. No longer capable of: *he is past learning* (*Hayward*). 3. Beyond; out of reach of: *the ship is past cannon-shot* (*Calamy*). 4. Beyond; further than: *we are not past the fens* (*Numbers*). 5. Above; more than: *the well was past ten feet deep* (*Spenser*).

PASTE, *s.* (*paste*, French.) 1. Any thing mixed up so as to be viscous and tenacious (*Dryden*). 2. Flour and water boiled together so as to make a cement. 3. Artificial mixture, in imitation of precious stones.

To PASTE, *v. a.* (*paster*, Fr. from the noun.) To fasten with paste (*Locke*).

PASTEBOARD. *s.* (*paste* and *board*.) Masses made anciently by pasting one board on another; now made sometimes by macerating paper, and casting it in moulds, and sometimes by pounding old cordage and casting it in forms (*Dryden*).

PA'STEBOARD. *a.* Made of pasteboard (*Mortimer*).

PASTER OF A HORSE, the part which intervenes between the joint of that name and the coronet of the hoof. This part should be short, especially in middle-sized horses; because long pasterns are weak, and cannot so well endure labour. Some horses indeed have them so long and flexible, that in walking they almost touch the ground with them, which is a great imperfection, and shows the animal unfit for any sort of fatigue.

PASTER-JOINT, in the manage, the fetlock of a horse: the joint above the pastern, which serves for a second knee in each fore-leg, and a second hough in each hind-leg. A horse is short or long-jointed, according to the shortness or length of the pastern, the short-jointed is the most esteemed.

PASTES for birds: the common food provided for them in aviaries, which may be thus prepared.

Grind half a peck of the finest horse beans, well dried, very fine, and bolt them through a fine boulder, such as is used for wheat meal;

or if your stock of birds do not require so great a quantity, use in the following proportion.

Take of the above meal, two pounds; of the best sweet almonds, blanched, one pound; beat these very well in a mortar, and add a quarter of a pound of fresh butter: put them into a copper saucepan, well tinned, mix all well together, and set the pan over a charcoal fire, that the paste may not smell of smoak, and keep continually stirring it all the while it stands upon the fire with a wooden-spoon, that so it may boil gradually, and not burn; then take four yolks of eggs, and a little saffron, and when the butter is melted, having some virgins-honey ready, drop in some by degrees, continually stirring it, that all the ingredients may incorporate.

This being done, take a fine cullender, and strain the compound through, which should be thin, and not in lumps; the remainder of the paste may be beaten in a mortar again, and if it will not pass through the holes, set it upon the fire again, and let it boil gently, and then try it through the cullender, till it comes to such a quantity and quality as is fit for the number of birds you keep. Repeat this as often as you have occasion.

This paste may be mixed with any bird-meat whatever, is a strengthening diet, and will continue good for six months if you pour a little melted clarified honey upon it.

PASTES for fishing are variously compounded; almost according to the angler's own fancy; but there should always be a little cotton wool, shaved lint, or fine flax, to keep the parts of it together, that it may not fall off the hook. White bread and honey will make a proper paste for carp or tench. Fine white bread alone, with a little water, will serve for roach and dace; and mutton suet and soft new cheese for barbels. Strong cheese with a little butter, and coloured yellow with saffron, will make a good winter paste for a chub.

But among all the variety of pastes, there is none so often used as the simple and plain one made with white bread and milk, which requires only clean hands.

The following observations concerning pastes may be of use to a young angler, being all founded on experience:

In September, and all the winter months, when you angle for chub, carp, and bream, with paste, let the bait be as big as a large hazle nut: but for roach and dace, the bigness of an ordinary bean is sufficient.

You may add to any paste, assa-fœtida, oil of ivy, oil of petre, gum ivy, and many other things, which sometimes wonderfully increase your sport.

PASTE, in the glass-trade, a kind of coloured glass, made of calcined crystal, lead, and other metallic preparations so as to imitate the natural gems. The basis of these compositions is a pure glass, prepared from pounded quartz, fused with alkali, with the addition of borax and of oxyd of lead. The latter gives density to the glass, a susceptibility of receiving a higher polish, and a greater refractive power, by which the lustre is increased. Different

colours are obtained by the addition of various metallic oxyds. The oxyd of gold gives a red; of cobalt, blue; of manganese, purple; of lead, yellow; and of iron, green: and these colours are so rich, as to be equal, or even superior, to those of natural gems, though in lustre, hardness, and durability, the pastes are far inferior. They may be distinguished by their inferior specific gravity, and their softness, which is such that they can be scratched by the knife.

PASTIL or PASTEL, among painters, a kind of paste made of different colours ground up with gum-water, in order to make crayons.

PASTIL, in pharmacy, is a dry composition of sweet-smelling resins, aromatic woods, &c. sometimes burnt to clear and scent the air of a chamber.

PASTIME. *s.* (*pass* and *time*.) Sport; amusement; diversion (*Watts*).

PASTINACA. Parsnep. In botany, a genus of the class pentandria, order digynia. Fruit elliptic, compressed, flat; petals involute, entire. Three species.

1. *P. lucida*. Lucid parsnep. Leaves simple, heart-shaped, lobed, lucid, acutely crenate. A native of the south of Europe.

2. *P. opoponax*. Rough parsnep. Leaves pinnate; leaflets incomplete at the base on the upper side; root-leaves simple, heart-shaped, acutely crenate; flowers umbelled, yellow, appearing in July: a native of the south of Europe. The inspissated juice of the stem is the opoponax of the shops.

3. *P. sativa*. Common parsnep. Leaves simply pinnate, downy underneath, sometimes glabrous. Its roots are sweet and nutritious, and in high esteem as an article of food. They possess an aromatic flavour, more especially those of the wild plant, and are exhibited in calculous complaints for their diuretic and sheathing qualities. The parsnep is to be propagated by sowing the seeds in February or March, in a rich mellow soil, which must be deep dug, that the roots may be able to run deep without hindrance.

It is a common practice to sow carrots at the same time, upon the same ground with the parsneps; and if the carrots are designed to be drawn young, there is no harm in it. The parsneps when they are grown up a little, must be thinned to a foot distance, and carefully kept clear of weeds. They are finest tasted just at the season when the leaves are decayed; and such as are desirous to eat them in spring, should have them taken up in autumn, and preserved in sand. When the seeds are to be saved, some very strong and fine plants should be left for it at four feet distance, and towards the end of August, or in the beginning of September, the seeds will be ripe: they must then be carefully gathered, and dried on a coarse cloth. They should always be sown the spring following, for they do not keep well.

PASTO, or ST. JUAN DE PASTO, a town of New Granada, in Popayan, seated in a valley, 120 miles N. by E. of Quito. Lon. 76. 55 W. Lat. 1. 50 N.

PASTOR, originally, signifies one that (*pasceit*) feeds. Hence it was anciently used

for a shepherd, or advocate; and is now appropriated to a minister, or one that has the cure of souls.

PASTORAL, something that relates to shepherds, *pastores*. The poets represent the innocence of a pastoral life, and pastoral manners, in the most agreeable light. We must not imagine them so beautiful in nature as in their descriptions.

PASTORAL, in poetry, denotes a composition the subject whereof is something in the pastoral, or at least in rural life, and the persons shepherds, or at least rustics.

Most authors, except the English, esteem pastoral of the dramatic kind; and define it a dramatic piece, wherein the persons are clad like nymphs and shepherds, and act their own amours. The scene is always in the fields or the woods; whence Tasso calls pastoral, *favola boscareccia*.

Such are the Pastor Fido, of Guarini; the Aminta, of Tasso; the Sylvia, of Mairet, the French poet; and the Comus, of Milton, &c. Tasso assumes to himself the honour of having invented pastoral; but the first idea of this kind of drama seems to be Beccari's, who made the first attempt of this kind in 1552. But Tasso's Aminta, which did not appear till the year 1573, effacing what had been done by Beccari, the first author was forgot, and Tasso was left as the inventor.

It is certain this kind of pastoral fable, composed according to the rules of the stage, was unknown among the ancients. The Greeks and Latins have indeed introduced shepherds in their eclogues; but these eclogues had nothing theatrical in them; nor were the shepherds ever brought upon the stage.

This kind of dramatic pastoral is as yet but little known among us: nor have we any thing considerable under the title pastorals, but country pieces after the manner of the eclogues or idyllions of the ancients.

Every pastoral, even in this last view, should have a little plot or fable, which may deserve the title of a pastoral scene. It must be simple, and but one; yet not so as to refuse all digressions, provided they be but short. This rule of the plot is every where observed by Virgil.

PASTORAL, *a.* (*pastoralis*, Latin.) 1. Rural; rustic; beseeching shepherds; imitating shepherds (*Sidney*). 2. Relating to the care of souls (*Hooker*).

PASTORAL-STAFF. See **CROSIER**.

PASTORALE (Ital.) In music, an epithet applied to soft rural movements, generally written in twelve quavers, and moving by alternate crotchets and quavers, like the Siciliano.

PASTRY, *s.* (*pastisserie*, Fr. from *paste*.) 1. The act of making pies (*King*). 2. Pies or baked paste (*Tusser*). 3. The place where pastry is made (*Shakspeare*).

PASTRY-COOK, *s.* (*pastry* and *cook*.) One whose trade is to make and sell things baked in paste (*Arbutnot*).

PASTURABLE, *a.* (from *pasture*.) Fit for pasture.

PASTURAGE, *s.* (*pasturage*, French.) 1. The business of feeding cattle (*Spenser*). 2. Lands grazed by cattle (*Addison*). 3. The use of pasture (*Arbutnot*).

PASTURE, *s.* (*pasture*, Fr.) 1. Food; the act of feeding (*Brown*). 2. Ground on which cattle feed (*Locke*). 3. Human culture; education (*Dryden*).

To PASTURE, *v. a.* (from the noun.) To place in a pasture.

To PASTURE, *v. n.* (from the noun.) To graze on the ground (*Milton*).

PASTURE LAND. See **HUSBANDRY**.

PASTY, *s.* (*paste*, French.) A pie of crust raised without a dish (*Shakspeare*).

PAT, *a.* (from *pas*, Dutch, *Skinner*.) Fit; convenient; exactly suitable (*Atterbury*).

PAT, *s.* (*patte*, French.) 1. A light quick blow; a tap (*Collier*). 2. A small lump of matter beat into shape with the hand.

To PAT, *v. a.* (from the noun.) To strike lightly; to tap (*Bacon*).

PATACHE, *s.* A small ship (*Ainsworth*).

PATACCOON, *s.* A Spanish coin worth four shillings and eight pence English (*Ains*).

PATÆCI, in mythology, images of gods which the Phœnicians carried on the prows of their galleys. Herodotus, lib. iv. calls them *πατακιοι*. The word is Phœnician, and derived from *pethica*, i. e. *titulus*. See Bochart's Chanaan, lib. ii. cap. 3. But Scaliger does not agree. Morin derives it from *πατακας*, monkey, this animal having been an object of worship among the Egyptians, and hence might have been honoured by their neighbours. Mr. Elsner has observed, that Herodotus does not call the patæci, gods; but that they obtained this dignity from the liberality of Hesychius and Suidas, and other ancient lexicographers, who place them at the stern of ships; whereas Herodotus placed them at the prow. Scaliger, Bochart, and Selden have taken some pains about this subject.—Mr. Morin has also given us a learned dissertation on this head in the *Memoires de l'Acad. des Inscript. et Belles Lettres*, tom. i.; but Mr. Elsner thinks it defective in point of evidence.

PATAGONIA, a country in the most southern part of S. America, bounded on the N. by Paraguay and Chili, and extending 1100 miles on the eastern coast, from Rio de la Plata to the straits of Magellan. The natives of Patagonia are tall, stout, and well made, some of them six feet five and seven inches in height; but their hands and feet are remarkably small. Their colour is a kind of bronze. They are all painted, and clothed nearly in the same manner: the circles round the two eyes are, some white and red, and some red and black. Their teeth are as white as ivory, remarkably even and well set. They have no other clothing than skins, which they wear with the hair inward; and a piece of leather covers their private parts. This country has no timber in the S. parts, though the N. contains an immense quantity, and numerous flocks of cattle. The E. coast is generally low. The principal harbour is that of port St. Julian.

PATANI, a town on the N.E. coast of the peninsula of Malaya, capital of a kingdom of the same name, with a well-defended harbour. The inhabitants have some trade with the Chinese: It is 300 miles N. by W. of Malacca. Lon. 100. 50 E. Lat. 7. 5 N.

PATAY, a town of France, in the département of Loiret, where the English were defeated in 1429, by Joan of Arc. It is 15 miles N.W. of Orleans.

PATAVINITY, among critics, denotes a peculiarity of Livy's diction; derived from Patavium or Padua, the place of his nativity; but wherein this patavinity consists, they are by no means agreed. Asinius Pollio, according to Quintilian, taxed Livy with patavinity. But what he meant by this censure we believe no man can say. Morhof believes it to be a singular turn of expression, and some phrases peculiar to the Paduese. All we certainly know about it is, that it was a fault in the language of Livy, not in the sentiments or manner. In all probability, it is one of those delicacies that are lost in a dead language. Dan. Georg. Morhof published a treatise De Patavinitate Liviana, at Kiel, in 1685, where he explains, very learnedly, the urbanity and pergerinity of the Latin tongue.

PATARA, a town of Lycia, situate on the eastern side of the mouth of the river Xanthus, with a capacious harbour, a temple and an oracle of Apollo, surnamed Patareus. The god was supposed by some to reside for the six winter months at Patara, and the rest of the year at Delphi.

To PATCH. v. n. (*putzer*, Danish; *pezzare*, Ital.) 1. To cover with a piece sewed on (*Locke*). 2. To decorate the face with small spots of black silk (*Addison*). 3. To mend clumsily; to mend so as that the original strength or beauty is lost (*Dryden*). 4. To make up of shreds or different pieces.

PATCH. s. (*pezzo*, Ital.) 1. A piece sewed on to cover a hole (*Dryden*). 2. A piece inserted in mosaic or variegated work (*Locke*). 3. A small spot of black silk put on the face (*Suckling*). 4. A small particle; a parcel of land (*Shakspeare*). 5. A paltry fellow: obsolete (*Shakspeare*).

PATCHER. s. (from *patch*.) One that patches; a butcher.

PATCHERY. s. (from *patch*.) Butchery; bungling work: not used (*Shakspeare*).

PATCHWORK. s. (*patch* and *work*.) Work made by sewing small pieces of different colours interchangeably together (*Swift*).

PATE. s. The head (*Spenser. South*).

PATED. a. (from *pate*.) Having a pate. It is used only in composition: as, long-pated or cunning; shallow-pated or foolish.

PATEE, or PATTEE, in heraldry, a cross small in the centre, and widening to the extremes, which are very broad.

PATEFACTION. s. (*patefactio*, Lat.) Act or state of opening (*Ainsworth*).

PATEL, a celebrated French painter, commonly called by his countrymen the French Claude, from his successful imitation of that

great master. His works shew a mind that had studied nature with great observation. We have so little knowledge of him, that it is not known in what age he lived.

PATELLA. (*patina*, a dish; so named from its shape). *Rotula*. The knee pan. A small flat bone, which in some measure resembles the common figure of the heart with its point downwards, and is placed at the fore part of the joint of the knee. It is thicker in its middle part than at its edge. Anteriorly, it is a little convex, and rough for the insertion of muscles and ligaments; posteriorly, it is smooth, covered with cartilage, and divided by a middle longitudinal ridge, into two slightly concave surfaces, of which the external one is the largest and deepest. They are both exactly adapted to the pulley of the os femoris. The edges of this posterior surface are rough and prominent, where the capsular ligament is attached, and below is a roughness at the point of the bone, where the upper extremity of a strong tendinous ligament is fixed, which joins this bone to the tuberosity at the upper end of the tibia. This ligament is of considerable thickness, about an inch in breadth, and upwards of two inches in length. The rotula is composed internally of a cellular substance, covered by a thin bony plate; but its cells are so extremely minute, that the strength of the bone is, upon the whole, very considerable. In new-born children it is entirely cartilaginous. The use of this bone seems to be, to defend the articulation of the joint of the knee from external injury. It likewise tends to increase the power of the muscles which act in the extension of the leg, by removing their direction farther from the center of motion, in the manner of a pulley. When we consider the manner in which it is connected with the tibia, we find that it may very properly be considered as an appendix to the latter, which it follows in all its motions, so as to be to the tibia what the olecranon is to the ulna; with this difference, however, that the rotula is moveable, whereas the olecranon is a fixed process. Without this mobility the rotatory motion of the leg would have been prevented.

PATELLA. Limpet. In zoology, a genus of the class vermes, order testacea. Animal a limax; shell univalve, subconic, shaped like a bason; without spine. Two hundred and forty species, scattered over the globe; but the greater part found in a fossil state, or thrown up by the tide, and the natural residence unknown. About eight are inhabitants of our own coasts. The genus was known to the ancient Greeks, who employed the animal as an esculent. It is subdivided into the following sections.

A. Furnished with an internal lip; shell entire.

B. With the margin angular, or irregularly toothed.

To this division belongs

1. *P. vulgata*, or common limpet-shell. Found on our own shores: with about fourteen obsolete angles, and a dilated, acute crenate margin; crown central. It is found

inhabiting the marine rocks of Europe and India; two inches high, three or four wide: in the older shells the margin is nearly even, and the number of ribs irregular. The shell varies in colour and marks, but is generally cinereous, white or reddish, with or without bands.

2. *P. badia*. Shell subconvex, brown, within bay, with twelve larger rays each surrounded by a rib, and as many smaller ones. Residence unknown: two and three quarters inches long. Shell more or less flat, rarely pellucid, often sprinkled with green or cinereous dots, varied or undulate with grey; sometimes inclining to pale yellow, or liver-colour, or spotted with black; the margin and the crown varied with rays of different colours, the latter often with five rows of blue dots; the bottom with a spatulate liver-colour, or greenish spot surrounded with a single or double differently coloured band; the inner surface often inclining to brown, pale yellow, liver-colour, or grey.

C. With a pointed recurved tip or crown.

3. *P. lacustris*. Shell very entire, oval, membranaceous, with a nearly central mucronate reflected shell. Inhabits the fresh waters of our own country and of other parts of Europe; from one and a half to two and a half lines long. Shell very thin and brittle, pellucid, white, above convex, beneath concave; crown with a very minute point: the inhabitant with two truncate concealed tentacles, furnished with eyes at the interior angle.

D. Very entire, and not pointed at the tip or crown.

E. With the crown or tip perforated.

PATELLÆ. In conchology, dish-shells, so denominated from their shape: larger in general than the nautilus, pearl or mother-of-pearl shells, as oysters, &c.

PATEN. *s.* (*petina*, Latin.) A plate (*Shakspeare*).

PATENT, something that stands open or expanded: thus a leaf is said to be patent when it stands nearly at right angles with the stalk.

PATENT, or *LETTERS PATENT*, are writings sealed with the great seal of England, by which a man is authorised to do, or to enjoy, any thing which of himself he could not. They are so called on account of their form, being open, with their seal affixed, ready to be exhibited for the confirmation of the authority delegated by them. Letters patent for new inventions are obtained by petition to the crown: they go through many offices, and are usually granted for the term of 14 years, upon condition that the patentee specify his invention or improvement, in such a manner that the public may receive the benefit of it, and may be at liberty to practise or employ such contrivance at the expiration of the exclusive privilege. If, however, it should be found or proved, that the patentee's claims are not supported by originality; or, that he has wilfully disguised his invention, by giving a confused and erroneous specification, the privilege becomes void; and any person is permitted to adopt and make use of it with impunity. Many pa-

tents, indeed, are believed to have been surreptitiously obtained by speculative persons; who, from sordid, lucrative motives, swear themselves to be the inventors of things which they have read in foreign books, such as are not in general circulation. These unprincipled adventurers ought to be rigorously examined, whether they have any, and what pretensions to an art or manufacture, of which they profess to be adepts. Thus, it would be easily discovered, that they are plagiarists, and impostors, who evade the provisions made by law. A patent at the lowest cost, and when no opposition is given to it, will, for fees of office, specification, &c. cost for the three branches of the United Kingdom about three hundred pounds. The only complete published repository of specifications of patent inventions is the Repertory of Arts and Manufactures, now extending to several octavo volumes: it is published monthly, and contains descriptions of many highly curious and important inventions. Abridgements of several of these specifications may be seen in the Retrospect of Discoveries, the Monthly Magazine, and a few other periodical publications.

PATENTEE. *s.* One who has a patent.

PATER (Paul), born at Menensdorf, in Hungary, in 1656, and driven from his country when very young, because of his attachment to the protestant religion. The duke of Wolfembuttel made him his librarian; and he became professor of mathematics in the college of Dantzic, where he died in 1724. He was the author of numerous works on philosophy and literature. (*Watkins*).

PATER (John Baptiste), a celebrated landscape painter, born at Valenciennes, in 1695, and the disciple of Anthony Watteau. He had a good taste for colouring, but he neglected the study of nature. He died in 1736. (*Watkins*).

PATERA, among antiquaries, a goblet, or vessel, used by the Romans in their sacrifices, wherein they received the blood of their victims, offered their consecrated meats to the gods, and wherewith they made libations. The word is formed from *pateo*, I am open, *quot pateat*; because it had a great aperture; in contradistinction to bottles, &c.

The patera is an ornament in architecture, frequently introduced in friezes, fascias, and imposts, over which are hung festoons of husks or flowers; and they are sometimes used by themselves, to ornament a space; and in this case it is common to hang a string of husks or drapery over them.

PATERCULUS (Caius Velleius), an ancient Roman historian, who flourished under the emperor Tiberius Cæsar. He commanded the cavalry in Germany under Tiberius, whom he accompanied for nine years successively, and was rewarded with the prætorship. He wrote an epitome of the Roman history in two books, which is extant. He is supposed to have died in the year of Rome 784, and in his 50th year.

One manuscript only has had the luck to be

found, as well of this author among the Latins, as Hesychius among the Greeks: in which, says a great critic of our own nation, "the faults of the scribes are found so numerous, and the defects so beyond all redress, that, notwithstanding the pains of the learned and most acute critics for two whole centuries, these books still are, and are like to continue, a mere heap of errors." No ancient author but Priscian makes mention of Paterculus: the moderns have done him infinitely more justice, and have illustrated him with notes and commentaries. He was first published, from the manuscript of Morbac, by Rhenanus, at Basil, in 1520; afterwards by Lipsius, at Leyden, in 1851; then by Gerard Vossius, in 1639; next by Boeclerus, at Strasburg, in 1642; then by Tysius and others; and, lastly, by Peter Berman, at Leyden, 1719, in 8vo. To the Oxford edition in 1693, 8vo. were prefixed the *Annales Velleiani* of Mr. Dodwell, which show deep learning and a great knowledge of antiquity.

PATERNAL. *a.* (*paternus*, Latin.) 1. Fatherly; having the relation of a father; pertaining to a father (*Hammond*). 2. Hereditary; received in succession from one's father (*Dryden*).

PATERNITY. *s.* (from *paternus*, Latin.) Fathership; the relation of a father (*Arbuth.*).

PATER-NOSTER, the Lord's prayer, so called from the two first words thereof in Latin. It is also sometimes used for a chapel or string of beads. And, in architecture, the same term is used for a sort of ornament cut in the form of beads, either oval or round, used on astragals, baguettes, &c.

PATH. *s.* (*pað*, Saxon.) Way; road; track; a narrow way; any passage (*Addison*).

PATH OF THE VERTEX, a term frequently used by Mr. Flamsteed, in his *Doctrine of the Sphere*, denoting a circle, described by any point of the earth's surface as the earth turns round its axis. This point is considered as vertical to the earth's centre; and is the same with what is called the vertex or zenith in the Ptolemaic projection.

PATHETIC, whatever relates to the passions, or that is proper to excite or awake them. The word comes from the Greek *παθος*, passion or emotion. See **PASSION**.

PATHETIC, in music, something very moving, expressive, or passionate; capable of exciting pity, compassion, anger, or other passions. Thus we speak of the pathetic style, a pathetic figure, pathetic song, &c. The chromatic genus, with its greater and lesser semitones, either ascending or descending, is very proper for the pathetic; as is also an artful management of discords; with a variety of motions, now brisk, now languishing, now swift, now slow. Nieuwentyt speaks of a musician at Venice who so excelled in the pathetic, that he was able to play any of his auditors into distraction: he says also, that the great means he made use of was the variety of motion, &c.

PATHETICALLY. *ad.* In such a manner as may strike the passions (*Dryden*).

PATHETICALNESS. *s.* (from *pathetical*)

Quality of being pathetic; quality of moving the passions.

PATHETICI. (from *παθος*, an affection, because they direct the eyes to express the passions of the mind.) In anatomy, trochleatores. The fourth pair of nerves. They arise from the crura of the cerebellum laterally, and are distributed in the musculus obliquus superior seu trochlearis.

PATHLESS. *a.* (from *path*.) Untrodden; not marked with paths (*Sandys*).

PATHOGNOMONIC. (*παθογνωμονικός*; from *παθος*, a disease, and *γνωσκω*, to know). A term given to those symptoms which are peculiar to a disease. They are also termed proper or characteristic symptoms.

PATHOLOGICAL. *a.* (from *pathology*.) Relating to the tokens or discoverable effects of a distemper.

PATHOLOGIST. *s.* (*παθος* and *λεγω*.) One who treats of pathology.

PATHOLOGY. (*παθολογία*; from *παθος*, a disease, and *λογος*, a discourse.) The doctrine of diseases. It comprehends nosology, ætiology, symptomatology, and therapia. See **MEDICINE**.

PATHOS. A Greek term literally signifying passion.

PATHWAY. *s.* (*path* and *way*.) A road; a narrow way to be passed on foot (*Shakspeare*).

PATIBLE. *a.* (from *pator*, Lat.) Sufferable; tolerable.

PATIBULARY. *a.* (*patibulaire*, Fr. from *patibulum*, Lat.) Belonging to the gallows.

PATIENCE. *s.* (*patience*, Fr. *patientia*, Lat.) 1. The power of suffering; calm endurance of pain or labour (*Prior*). 2. The quality of expecting long without rage or discontent (*Matthew*). 3. Perseverance; continuance of labour (*Harte*). 4. The quality of bearing offences without revenge or anger (*Harte*). 5. Sufferance; permission (*Hooker*).

For some of the best remarks on the nature of patience, and on the unreasonable expectations with regard to patience from those that are well of those that are sick, with an account of the constituent parts of patience, and remedies against real impatience, we refer to Jeremy Taylor's *Holy Dying*, chap. iii. sections 2, 3, 4, and 5.

PATIENCE, in botany. See **RUMEX**.

PATIENT. *a.* (*patient*, Fr. *patients*, Latin.) 1. Having the quality of enduring (*Ray*). 2. Calm under pain or affliction (*Dryden*). 3. Not revengeful against injuries. 4. Not easily provoked (*Thessalonians*). 5. Persevering; calmly diligent (*Newton*). 6. Not hasty; not vitiously eager or impetuous (*Prior*).

PATIENT. *s.* (*patient*, French.) 1. That which receives impressions from external agents (*Gov. of the Tongue*). 2. A person diseased, under the care of another (*Addison*).

To **PATIENT.** *v. a.* (*patienter*, French.) To compose one's self: obsolete (*Shaks.*).

PATIENTIA. (from *pator*, to bear or suffer). The herb monk's rhubarb, from its gentle purging qualities. See **RHABBARBARUM**.

P A T

P A T

PATIENTLY. *ad.* (from *patient*.) 1.

Without rage under pain or affliction (*Swift*).

2. Without vitious impetuosity (*Calamy*).

PATINE. *s.* (*patina*, Lat.) The cover of a chalice (*Ainsworth*.)

PATKUL (John Reinhold), count, a brave and accomplished man, a native of Livonia, employed to represent the grievances of that province to Charles XI. king of Sweden, in 1689, which commission he discharged with a noble intrepidity and freedom. This remonstrance was construed as rebellious, for which the whole body underwent a process, and Patkul was condemned to lose his estates and honours, and to have his right hand and head cut off. To avoid so cruel a sentence, he fled, and entered into the Russian service. When Charles XIth was dead, and Charles XIIth had deposed Augustus, king of Poland, he obliged that unfortunate prince to deliver Patkul up to him, though he was then invested with the character of envoy extraordinary from the court of Russia. Charles caused him to be broken on the wheel, with every circumstance of ignominy and refined cruelty, in 1707.

PATLY. *ad.* (from *pat*.) Commodiously; fitly.

PATMOS, or **PATINO**, an island of the Archipelago, lying 26 miles S. of the isle of Samos. It is 20 miles in circumference, and one of the most barren in the Archipelago; but is famous for being the place where St. John composed the book of Revelation. A few valleys only are capable of some cultivation; but it abounds with partridges, rabbits, quails, turtles, pigeons, and snipes. In the midst of the island rises a mountain, terminated by the convent of St. John; the abbot of which is the prince of the country, and pays a certain tribute to the grand seignor. The hermitage of the Apocalypse is situate on the side of the mountain between the convent and the port of Scala. It leads to the church of the Apocalypse, which is built against a grotto in a rock, pointed out as the asylum of St. John, during his exile at Patmos. The inhabitants are chiefly Greek Christians, sailors or ship-builders; and have some trade in cotton, and stockings of their own manufacture. The women are generally pretty, but they disfigure themselves by the excessive use of paint. Lon. 26. 24 E. Lat. 37. 24 N.

PATNA, a city of Hindoostan, capital of Bahar, seated on the right bank of the Ganges, opposite the influx of the Gunduck, and fortified with a wall and citadel. In the citadel were confined the prisoners taken in 1764, by Meer Cossim, nabob of Bengal, by whose order they were massacred. The buildings are high, but the streets are narrow. It is a place of considerable trade, 400 miles N.W. of Calcutta. Lon. 85. 0 E. Lat. 25. 35 N.

PATOMAC. See **POTOMAC**.

PATONCE, in heraldry, is a cross, flory at the ends; from which it differs only in this, that the ends, instead of turning down like a fleur-de-lis, are extended somewhat in the pattee form.

PATRAS, an ancient and flourishing town in the Morea, with a Greek archbishop's see. The Jews, who are one-third of the inhabitants, have four synagogues, and there are several handsome mosques and Greek churches. The Jews carry on a great trade in silk, leather, honey, wax, and cheese. There are cypress trees of a prodigious height, and excellent pomegranates, citrons, and oranges. It has been taken and retaken several times; but the Turks are now masters of it. It is seated on the declivity of a hill, near the sea, 20 miles S.W. of Lepanto. Lon. 21. 45 E. Lat. 38. 17 N.

PATRIA, a town of Naples, in Terra di Lavoro, situate near a lake, to which it gives name, 13 miles N.W. of Naples.

PATRIARCH. (*patriarcha*, formed of *πατρις*, a family, and *αρχων*, chief.) One of those first fathers who lived towards the beginning of the world; and who became famous by a long line of descendants.

Abraham, Isaac, and Jacob, and his twelve sons, are the patriarchs of the Old Testament. Seth, Enoch, &c. were antediluvian patriarchs.

Long life and a number of children were the blessings of the patriarchs.

The patriarchal government consisted in the fathers of families, and their first-born after them, exercising all kinds of ecclesiastical and civil authority in their respective households: and to this government, which continued till the time of the Israelites dwelling in Egypt, some have ascribed an absolute and despotic power, extending even to the punishment by death. In proof of this, they allege the curse pronounced by Noah upon Canaan, Gen. ix. 25; but it is replied, that in this affair Noah seems to have acted rather as a prophet than a patriarch. Another instance of supposed despotic power is Abraham's turning Hagar and Ishmael out of his family, Gen. xxi. 9, &c.; but this furnishes no evidence of any singular authority vested in the patriarchs, as such, and peculiar to those ages. The third instance alleged to the same purpose is that of Jacob's denouncing a curse upon Simeon and Levi, Gen. xlix. 7, which is maintained by others to be an instance of prophetic inspiration, more than of patriarchal authority. The fourth instance is that of Judah with regard to Tamar, Gen. xxxviii. 24; with regard to which it is observed, that Jacob, the father of Judah, was still living, that Tamar was not one of his own family, and that she had been guilty of adultery, the punishment of which was death by burning, and that Judah on this occasion might speak only as a prosecutor.

PATRIARCH is also used, in christendom, for the bishops in possession of some of the grand sees, independent of the papal jurisdiction.

The patriarchate has been always esteemed the supreme dignity in the church: so that, to rise by degrees, the bishop had only under him the territory of the city whereof he was bishop; the metropolitan commanded a province, and

had for suffragans the bishops of his province; the primate was the chief of a diocese, and had several metropolitans under him; and the patriarch had under him several dioceses, and the primates themselves were under him. But this order was not always observed.

Usher, Pagi, De Marca, and Morinus, attribute the establishment of the grand patriarchates to the apostles. They suppose that the apostles, according to the description of the world then given by geographers, pitched on the three principal cities in the three parts of the known world; viz. Rome, in Europe; Antioch, in Asia; and Alexandria, in Africa: and thus formed a trinity of patriarchs.

Others, far from attributing this institution to the apostles, maintain that the name patriarch was unknown at the time of the council of Nice; and that, for a long time afterwards, patriarchs and primates were confounded together; as being all equally chiefs of dioceses, and equally superior to metropolitans, who were only chiefs of provinces. Hence it is that Socrates gives the title patriarch to all the chiefs of dioceses, and reckons ten of them. In effect, it does not appear that the dignity of patriarch was appropriated to the five grand sees of Rome, Constantinople, Alexandria, Antioch and Jerusalem, till after the council of Chalcedon, in 451. For when the council of Nice regulated the limits and prerogatives of the three patriarchs of Rome, Antioch, and Alexandria, it did not give them the title of patriarchs, though it allowed them the pre-eminence and privileges thereof. Thus, when the council of Constantinople adjudged the second place to the bishop of Constantinople, who, till then, was only a suffragan of Hecleia, it said nothing of the patriarchate.

Nor is the term patriarchate found in the decree of the council of Chalcedon, whereby the fifth place is assigned to the bishop of Jerusalem; nor did these five patriarchs govern all the churches.

PATRIARCH is also applied to the chief of several churches in the East, who live out of communion with the Roman church: such are the patriarch of the Armenians, residing in the monastery of St. Gregory; the patriarch of the Abyssinians, called Abuna; the patriarchs of the Copti, the Jacobites, &c.

PATRIARCHAL. *a. (patriarchal, Fr.)*

1. Belonging to patriarchs; such as was possessed or enjoyed by patriarchs (*Norris*).
2. Belonging to hierarchial patriarchs (*Atkiffe*).

PATRIARCHAL CROSS, in heraldry, is that where the shaft is twice crossed; the lower arms being longer than the upper ones.

PATRIARCHATE. **PATRIARCHSHIP**. *s. (patriarchat, French, from patriarch.)* A bishopric superiour to archbishoprics (*Atkiffe*).

PATRIARCHY. *s.* Jurisdiction of a patriarch; patriarchate (*Brerewood*).

PATRICIAN. *a. (patricius, Latin.)* Senatorial; noble; not plebeian (*Addison*).

PATRICIAN, a title given, among the an-

ent Romans, to the descendants of the hundred, or, as some will have it, of the two hundred first senators chosen by Romulus; and by him called *patres*, fathers. Romulus established this order after the example of the Athenians; who were divided into two classes, viz. the *εὐπατρίδες*, *patricios*, and *δυναμῖνες*, *populares*. Patricians, therefore, were originally the nobility; in opposition to the plebeians. They were the only persons whom Romulus allowed to aspire to the magistracy; and they exercised all the functions of the priesthood till the year of Rome 495. But the cognizance and character of these ancient families being almost lost and extinguished by a long course of years, and frequent changes in the empire, a new kind of patricians were afterwards set on foot, who had no pretensions from birth, but whose title depended entirely on the emperor's favour. This new patriciate, Zosimus tells us, was erected by Constantine, who conferred the quality on his counsellors, not because they were descended from the ancient fathers of the senate, but because they were the fathers of the republic or of the empire. This dignity in time became the highest of the empire. Justinian calls it *summam dignitatem*.

PATRICIAN DEITIES, *Patricii Dei*, in mythology, were Janus, Saturn, the Genius, Pluto, Bacchus, the Sun, the Moon, and the Earth.

PATRICK (St.), the apostle and tutelar saint of Ireland, born in 377, and died in 460, after having founded the church of Armagh, the metropolitan see of that country. Some works falsely attributed to him were printed at London, in 1656, 8vo.

PATRICK (Peter), born at Thessalonica, under the reign of Justinian, who sent him in 534, as ambassador to Amalasonta, queen of the Goths; and in 550 to Chosroes, king of Persia, to conclude a peace with him. He was rewarded for these services with the office of master of the palace. We have by him the fragment of a work, entitled *The History of Ambassadors*, to be found in the collection of Byzantine historians, in 1648, folio.

PATRICK (Simon), a learned English bishop, born at Gainsborough, in Lincolnshire, in 1626. He was educated at Queen's college, Cambridge, and afterwards became chaplain to sir Walter St. John. He had the rectory of St. Paul's, Covent-garden: where he continued all the time of the plague in 1665. In 1678, he was made dean of Peterborough. During the reign of king James, the dean preached and wrote against the errors of the church of Rome. The year after the revolution he was appointed bishop of Chichester, and employed, with others newly consecrated, to settle the affairs of the church of Ireland. In 1691, he was translated to the see of Ely, in the room of the deprived bishop Turner. He died in 1707, after having published many works, among which his *Paraphrase and Commentaries on the Holy Scriptures*, 3 vols. fol. are most distinguished.

PATRIMONIAL. *a. (patrimonial, Fr.)* Possessed by inheritance (*Temple*).

PATRIMONY. *s.* (*patrimonium*, Latin; *patrimoine*, French.) An estate possessed by inheritance (*Davies*).

PATRIMONY OF ST. PETER, a province of Italy, in the Ecclesiastical State. It is 35 miles long and 30 broad; bounded on the N. by Orvieto, on the E. by Umbria and Sabina, on the S. by Campagna di Roma, and on the S.W. by the sea. Viterbo is the capital.

PATRINGTON, a town in the East riding of Yorkshire, with a market on Saturday. Here the Roman road from the Picts Wall ended. It is seated at the mouth of the Humber, 50 miles S.E. of York, and 191 N. of London. Lon. 0. 8 E. Lat. 53. 49 N.

PATRIOT. *s.* One whose ruling passion is the love of his country (*Tickel*).

PATRIOTISM. *a.* (from *patriot*.) Love of one's country; zeal for one's country.—“Zeal for the public good (says Mr. Addison), is the characteristic of a man of honour, and a gentleman, and must take place of pleasures, profits, and all other private gratifications: that whosoever wants this motive, is an open enemy, or an inglorious neuter to mankind, in proportion to the misapplied advantages with which nature and fortune have blessed him.” This love of our country does not import an attachment to any particular soil, climate, or spot of earth, where perhaps we first drew our breath, though those natural ideas are often associated with the moral ones; and, like external signs or symbols, help to ascertain and bind them; but it imports an affection to that moral system of community, which is governed by the same laws and magistrates, and whose several parts are variously connected one with the other, and all united upon the bottom of a common interest. Wherever this love of our country prevails in its genuine vigour and extent, it swallows up all sordid and selfish regards; it conquers the love of ease, power, pleasure, and wealth; nay, when the amiable partialities of friendship, gratitude, private affection, or regards to a family, come in competition with it, it will teach us to sacrifice all, in order to maintain the rights, and promote and defend the honour and happiness of our country. To pursue therefore our private interests in subordination to the good of our country; to be examples in it of virtue, and obedient to the laws; to choose such representatives as we apprehend to be the best friends to its constitution and liberties; and, if we have the power, to promote such laws as may improve and perfect it; readily to embrace every opportunity for advancing its prosperity; cheerfully to contribute to its defence and support; and, if need be, to die for it:—these are among the duties which every man, who has the happiness to be a member of our free and protestant constitution, owes to his country.

The constitution of man is such, that the most selfish passions, if kept within their proper bounds, have a tendency to promote the public good. There is no passion of more general utility than patriotism; but its origin may unquestionably be termed selfish. The

love of one's relations and friends is the most natural expansion of self-love: this affection connects itself too with local circumstances, and sometimes cannot easily be separated from them. It often varies, as relationship or place varies; but acquires new power when the whole community becomes its object. It was therefore with singular propriety that the poet said, “Self-love and social are the same.”—History furnishes a variety of instances of this exalted virtue, to which individuals of every civilized nation have occasionally aspired. The love of their country, and of the public good, seems to have been the predominant passion of the Spartans. Pedarethus having missed the honour of being chosen one of the three hundred who had a certain rank of distinction in the city, went home extremely pleased and satisfied; saying, “He was overjoyed there were three hundred men in Sparta more honourable than himself.”

For more on this subject, see Dr. Parr's Sermon preached at the parish church of Hatton, and Parsons's True Patriot, preached at Leeds.

PATROCINATE. *v. a.* (*patrocinor*, Lat.) To patronise; to protect; to defend.

PATROCLUS, one of the Grecian chiefs during the Trojan war; son of Menætius, by Sthenela. In consequence of an accidental murder he fled from Opus, where his father reigned, and retired to the court of Peleus king of Phthia, where he was kindly received, and where he contracted the most intimate friendship with Achilles the monarch's son. When the Greeks went to the Trojan war Patroclus also accompanied them, and he embarked with 10 ships from Phthia. He was the constant companion of Achilles, and when his friend refused to appear in the field, Patroclus imitated his example, and by his absence was the cause of the overthrow of many Greeks. But at last Nestor prevailed upon him to return to the war, and Achilles permitted him to appear in his armour. He soon routed the victorious armies of the Trojans, and obliged them to fly within their walls for safety. Apollo, who interested himself for the Trojans, placed himself to oppose him, and Hector, at the instigation of the god, attacked him. The engagement was obstinate, but at last Patroclus was overpowered by the valour of Hector, and the interposition of Apollo. His arms became the property of the conqueror, but his body was recovered and carried to the Grecian camp, where Achilles received it with the greatest lamentations. His funeral was observed with the greatest solemnity. Upon the death of Patroclus Achilles forgot his resentment, and entered the field to avenge the death of his friend. The patronymic of Aetorides is often applied to Patroclus, because Actor was father to Menætius.

PATROL, in war, a round or march made by the guards or watch in the night-time, to observe what passes in the streets, and to secure the peace and tranquillity of a city or camp. The patrol generally consists of a body of five or six men, detached from a body on guard,

and commanded by a serjeant: They go every hour of the night, from the beating of the tattoo until the reveille: they are to walk in the streets in garrisons, and all over the camp in the field, to prevent disorders, or any number of people from assembling together: they are to see the lights in the soldiers barracks put out, and to take up all the soldiers they find out of their quarters. Sometimes patrols consist of an officer and 30 or 40 men, as well infantry as cavalry; but then the enemy is generally near at hand, and consequently the danger greater.

TO PATRO'L. *v. n.* (*patrouiller*, Fr.) To go the rounds in a camp or garrison (*Black.*). 2. To guard a turnpike road, or to clear it of robbers.

PATRON. *s.* (*patronus*, Latin.) 1. One who countenances, supports, or protects (*Prior*). 2. A guardian saint (*Spenser*). 3. Advocate; defender; vindicator (*Locke*). 4. One who has donation of ecclesiastical preferment (*Wesley*).

PAT'RONAGE. *s.* (from *patron*.) 1. Support; protection (*Sidney*). 2. Guardianship of saints (*Addison*). 3. Donation of a benefice; right of conferring a benefice.

TO PA'TRONAGE. *v. a.* (from the noun.) To patronise; to protect (*Shakspeare*).

PATRONAGE (Arms of), in heraldry, are those on the top of which are some marks of subjection and dependance: thus the city of Paris lately bore the fleurs-de-lis in chief, to show her subjection to the king; and the cardinals, on the top of their arms, bear those of the pope, who gave them the hat, to show that they are his creatures.

PATRONAL. *a.* (from *patronus*, Latin.) Protecting; supporting; guarding; defending; doing the office of a patron (*Brown*).

PATRONESS. *s.* (feminine of *patron*.) 1. A female that defends, countenances, or supports (*Fairfax*). 2. A female guardian saint. 3. A woman that has the gift of a benefice.

TO PAT'RONISE. *v. a.* (from *patron*.) To protect; to support; to defend; to countenance (*Bacon*).

PATRONYMIC. *s.* (πατρωνυμικός.) Name expressing the name of the father or ancestor: as, *Tydidēs*, the son of Tydeus (*Broome*).

Patronymics are derived, 1. From the father, as *Pelides*, i. e. *Achilles*, the son of *Peleus*. 2. From the mother, as *Philyrides*, i. e. *Chiron*, the son of *Philyra*. 3. From the grandfather on the father's side, as *Æacides*, i. e. *Achilles*, the grandson of *Æacus*. 4. From the grandfather by the mother's side, as *Atlantiades*, i. e. *Mercury*, the grandson of *Atlas*: and, 5. From kings and founders of nations, as *Romulidæ*, i. e. the Romans, from their founder, king *Romulus*.

PATROS, mentioned by *Jeremiah* and *Ezekiel*, appears from the context to be meant of a part of Egypt. *Bochart* thinks it denotes the Higher Egypt: the Septuagint translate it the country of Pathure: in *Pliny* we have the *Nomos Pathurites* in the Thebais; in *Ptolemy*, *Pathyris*, probably the metropolis. From

the Hebrew appellation *Patros* comes the gentilitious name *Pathrusim*, *Moses*.

PATRU (*Oliver*), a French lawyer, born at Paris, in 1604. He was elected a member of the academy in 1640, on which occasion he made a most elegant oration of thanks, and gave rise to the custom ever after of admisory speeches. He died at Paris, Jan. 16, 1681. Patru was a rigid, though just, censor, inasmuch that, when *Racine* was thought to have made some observations, rather too subtle, upon the works of *Boileau*, the latter, by a parody on the Latin proverb, *ne sis mihi patruus*, replied, *ne sis mihi PATRU*.

PATTEN of a pillar. *s.* Its base (*Answer*).

PATTEN. *s.* (*patin*, French.) A shoe of wood with an iron ring, worn under the common shoe by women, to keep them from the dirt (*Camden*).

PATTENMAKER. *s.* (*patten* and *maker*.) He that makes pattens.

PATTENSEN, a town of Lower Saxony, in the principality of *Calemburg*, formerly surrounded with walls, moats, and ramparts. It is six miles S. of *Hanover*.

PATTEN-SHOE, in farriery, a horse-shoe so called, under which is soldered a sort of half-ball of iron, hollow within. It is designed for hip-shot horses, and put upon a sound foot, to the end that the horse, not being able to stand upon that foot without pain, may be constrained to support himself upon the lame foot, and so counteract the disposition, in the sinews, to contract the haunch.

Many ignorant pretenders, when a horse has been recently lamed in the shoulder, peg the other foot, or set on a patten-shoe to bring the lame shoulder upon a stretch; and some turn them immediately out to grass: but all this, as *Gibson* observes, is very preposterous, and the direct way to render him incurably lame; a patten-shoe being only necessary in old lamenesses, where the muscles have been a long while contracted.

TO PA'TTER. *v. n.* (from *patte*, Fr. the foot.) To make a noise like the quick steps of many feet (*Dryden*).

PATTERN. *s.* (*patron*, French; *patroon*, Dutch.) 1. The original proposed to imitation; the archetype; that which is to be copied; an exemplar (*Rogers*). 2. A specimen; a part shown as a sample of the rest (*Swift*). 3. An instance; an example (*Hooker*). 4. Any thing cut out in paper to direct the cutting of cloth, &c.

TO PA'TTERN. *v. a.* (*patronner*, French.) 1. To make in imitation of something; to copy (*Shakspeare*). 2. To serve as an example to be followed (*Shakspeare*).

PATTI, a town of Sicily, in *Val di Demona*, with a bishop's see, seated on the gulf of Patti, 28 miles W. of *Messina*. Lon. 15. 22 E. Lat. 38. 11 N.

PATTIARY, a town of *Hindustan Proper*, in the country of *Oude*, 55 miles N.W. of *Canogue*, and 55 E.N.E. of *Agra*. Lon. 79. 45 E. Lat. 27. 33 N.

PATTUN, or **PUTTAN**, a town of *Hin-*

dustan Proper, capital of a circar of the same name, in the country of Guzerat. It is 48 miles N. of Amedabad, and 132 S.W. of Oudipour. Lon. 72. 30 E. Lat. 23. 45 N.

PATULCIUS, a surname of Janus, which he received a *pateo*, because the doors of his temple were always open in the time of war. Some suppose that he received it because he presided over gates, or because the year began by the celebration of his festivals.

PAU, a town of France, in the department of the Lower Pyrenees, with a castle where Henry IV. was born. It is seated on an eminence, at the foot of which runs the Gave, 97 miles S. of Bourdeaux. Lon. 0. 4 W. Lat. 43. 15 N.

PAVAN, or **PAVANE**, a grave dance used among the Spaniards, and borrowed from them; wherein the performers made a kind of wheel or tail before each other, like that of *pavo*, a peacock; from whence the name is derived.

PAVANÆ LIGNUM. See **LIGNUM PAVANÆ**.

PAUCILOQUY. *s.* (*pauciloquium*, Lat.) Sparing and rare speech.

PAUCITY. *s.* (*paucitas*, Latin.) 1. Fewness; smallness of number (*Boyle*). 2. Smallness of quantity (*Brown*).

PAUTION (Alexis John Peter), a learned mathematician, born near Lussan in 1732. He distinguished himself by that great work, the *Metrologie*, which was a collection of the measures of all countries, and was first published in 1780. He was assisted, in the foreign department, by the astronomer Lalande. In this excellent production are introduced, Observations and Calculations on the ancient Measures, with Dissertations on Population, Agriculture, &c. He was also the author of *An Essay on the Screw of Archimedes*; and *A Theory of the Laws of Nature*, published in 1781, in which he attempts to refute the systems of Newton and Nollet. He died in 1799.

To PAVE. *v. a.* (*pavio*, Latin.) 1. To lay with brick or stone; to floor with stone (*Shakspeare*). 2. To make a passage easy (*Bacon*).

PAVEMENT, a layer of stone, or other matter, serving to cover and strengthen the ground of divers places for the more commodious walking on. In London the pavement for coach-ways is chiefly a kind of granite from Scotland: and on the footpath Yorkshire paving is used; courts, stables, kitchens, halls, churches, &c. are paved usually with tiles, bricks, flags, or fire-stones; and sometimes with a kind of free-stone and rag-stone. In France, the public roads, streets, courts, &c. are paved with gres, a kind of free-stone. In Venice, the streets, &c. are paved with brick; churches sometimes with marble, and sometimes with Mosaic work. In Amsterdam, and the chief cities of Holland, they call their brick pavement the burgomaster's pavement, to distinguish it from the stone or flint pavement, which is usually in the middle of the street, serving for the passage of their horses, carts,

coaches, and other carriages; the brick borders being designed for the passage of people on foot. Pavements of free-stone, flints, and flags, in streets, &c. are laid dry, that is, are retained in a bed of sand; those of courts, stables, ground-rooms, &c. are laid in mortar of lime and sand, or in lime and cement, especially if there be vaults or cellars underneath. Some masons, after laying a floor dry, especially of brick, spread a thin mortar over it, sweeping it backwards and forwards, to fill up the joints. Thirty-two statute bricks laid flat, pave a yard square; sixty-four edgewise. The square tiles used in paving, called paving bricks, are of various sizes, from six to twelve inches square. Pavements of churches, &c. frequently consist of stones of different colours, chiefly black and white, and of several forms, but chiefly square and lozenges, artfully disposed.

PAVEMENT OF TERRACE, is that which serves for the covering of a platform, whether it be over a vault, or on a wooden floor. Those over vaults are usually stones squared, and bedded in lead. Those on wood are either stones with beds, for bridges; tiles for ceilings in rooms; or layers of mortar made of cement and lime, with flints or bricks laid flat, as is still practised by people in the east and south, on the tops of their houses.

PAVETTA, in botany, a genus of the class tetrandria, order monogynia. Corol one-petalled, funnel-form, superior; stigma curved, berry two-seeded. Seven species, trees or shrubs of China or India.

PAVIA, a fortified town of Italy, in the duchy of Milan, with a celebrated university, and a bishop's see. In the centre of the town is a castle, where the ancient dukes of Milan resided. It has been often taken and retaken, the last time by the Austrians in 1746. It is seated on the Tesno, over which is a bridge, 15 miles S. of Milan. Lon. 9. 15 E. Lat. 45. 13 N.

PAVIER, or **PAVER**, one who paves or lays with stones.

PAVILION, in architecture, signifies a kind of turret or building, usually insulated, and contained under a single roof; sometimes square, and sometimes in form of a dome: thus called from the resemblance of its roof to a tent. Pavilions are sometimes also projecting pieces, in the front of a building, marking the middle thereof; sometimes the pavilion flanks a corner, in which case it is called an angular pavilion. The Louvre is flanked with four pavilions; the pavilions are usually higher than the rest of the building. There are pavilions built in gardens, commonly called summer-houses, pleasure-houses, &c. Some castles or forts consist only of a single pavilion.

PAVILION, in military affairs, signifies a tent raised on posts, to lodge under in the summer time.

PAVILION, is also sometimes applied to flags, colours, ensigns, standards, banners, &c.

PAVILION, in heraldry, denotes a covering in form of a tent, which invests or wraps up

the armories of divers kings and sovereigns, depending only on God and their sword. The pavilion consists of two parts; the top, which is the chapeau, or coronet; and the curtain, which makes the mantle. None but sovereign monarchs, according to the French heralds, may bear the pavilion entire, and in all its parts. Those who are elective, or have any dependence, say the heralds, must take off the head, and retain nothing but the curtains.

PAVILIONS, among jewellers, the undersides and corners of the brilliants, lying between the girdle and the collet.

To PAVILION. *v. a.* (from the noun.) 1. To furnish with tents (*Milton*). 2. To be sheltered by a tent.

PAUL, formerly named SAUL, was of the tribe of Benjamin, a native of Tarsus in Cilicia, a Pharisee by profession: first a persecutor of the church, and afterwards a disciple of Jesus Christ, and apostle to the Gentiles. It is thought he was born about two years before our Saviour, supposing that he lived 68 years, as we read in a homily which is in the sixth volume of St. Chrysostom's works. He was a Roman citizen (*Acts* xxii. 27, 28.), because Augustus had given the freedom of the city to all the freemen of Tarsus, in consideration of their firm adherence to his interests. His parents sent him early to Jerusalem, where he studied the law at the feet of Gamaliel, a famous doctor (*id.* xxiii. 3.). He made very great progress in his studies, and his life was always blameless before men; being very zealous for the whole observation of the law of Moses (*id.* xxvi. 4, 5.). But his zeal carried him too far; he persecuted the church, and insulted Jesus Christ in his members (*1 Tim.* i. 13.); and when the protomartyr St. Stephen was stoned, Saul was not only consenting to his death, but he even stood by and took care of the clothes of those that stoned him (*Acts* vii. 58, 59.). This happened in the 33d year of the common era, some time after our Saviour's death. The holy scriptures give the detail of St. Paul's conversion and subsequent proceedings very fully. As an orator he appears to have been very distinguished, Longinus himself having spoken of him in terms of approbation. Some very eloquent addresses of his are preserved in the *Acts* of the Apostles; and out of the twenty-seven inspired books of the New Testament, fourteen were written by Paul. Lord Lyttleton has a very valuable tract, in which the arguments for the truth of Christianity resulting from the conversion of St. Paul are very forcibly stated.

PAUL (Mark), or MARCO PAULO, a Venetian traveller. He penetrated, 1272, as far as the capital of Cublai Chan, of which he published an interesting account. Some authors imagine that Cambalus which he mentions is the town of Pekin. He makes no mention of the great wall of China.

PAUL I; pope after Stephen II. 757, died 10 years after.

PAUL II. (Peter Barbo), pope after Pius II. 1464, permitted the cardinals to wear a purple

habit, and the red cap of silk, and the mitre which hitherto had distinguished the sovereign pontiff. He died 1471, aged 54.

PAUL III. (Alexander Farnese), was pope after Clement VII. 1534. In his time began the famous council of Trent, whose first sitting was in 1545. He made a treaty with the Venetians and the emperor against the Turks, and pursued measures of severity against Henry VIII. He was respectable in private life, and at all times anxious to procure concord among the Christian princes. He died 1549, aged 82.

PAUL IV. (John Peter Caraffa), succeeded Marcellus II. 1555, aged near 80. He behaved with great haughtiness, and threatened with his severest displeasure Charles V. because he did not oppose sufficiently vigorous measures against the protestants; and when Elizabeth announced to him her accession, he complained that she had ascended the throne without the concurrence of the holy see, on which all the crowns of Europe were dependent. He died unlamented, 1559.

PAUL V. (Camillus Borghese), was pope after Leo XI. 1605. He was engaged in a dispute with the Venetians, and deserved the gratitude of the Romans for the various embellishments which he introduced, the collections of paintings, sculpture, &c. which he made, and the erection of public fountains and aqueducts. He died 1621, aged 69.

PAUL (Petrowitz), emperor of Russia, son of the great Catherine, was born 1754. He married, 1774, the daughter of the landgrave of Hesse Darmstadt, who died two years after, and for his second wife he took a princess of Wirtemberg, niece to the king of Prussia. He travelled in 1780, and during 14 months visited Poland, Austria, Italy, France, and Holland. On the death of his mother in 1796, he ascended the throne, and took an active part in the general confederacy of Europe, against France. He sent Suwarrow into Italy, where victory followed his steps, and he attacked the northern frontiers of France, in conjunction with the English; but all at once he was reconciled to his enemies, and seizing the property of the English, he banished their unhappy sailors to Siberia. This extravagance was stopped by sudden death. The unfortunate Paul was assassinated in April, 1801, by some of his discontented nobles. The cause of his extraordinary change of politics has been ascribed to the influence of a beautiful mistress, who was sent by the cabinet of Paris to second the labours of diplomatic intrigue. (*Lempriere*).

PAUL'S BETONY. See VERONICA.

PAULA, a Roman lady, born in 347, and descended from the Scipios and the Gracchi. She added to the brightest qualities of the mind, the virtues of Christianity. She founded a monastery at Bethlehem, where she practised the most rigid austerities. She was well versed in the Hebrew scriptures, and was the intimate friend of St. Jerome. She died in 407.

PAULI (Simon), physician to the king of

Denmark. He was the author of the *Flora Danica*, and of a treatise on the Use and Abuse of Tobacco and Tea. He died in 1682, aged 77.

PAULIANISTS, PAULIANISTÆ, a sect of heretics, so called from their founder Paulus Samosatenus, a native of Samosata, elected bishop of Antioch in 262. His doctrine seems to have amounted to this: that the Son and the Holy Ghost exist in God in the same manner as the faculties of reason and activity do in man; that Christ was born a mere man; but that the reason or wisdom of the Father descended into him, and by him wrought miracles upon earth, and instructed the nations; and finally, that on account of this union of the Divine word with the man Jesus, Christ might, though improperly, be called God. It is also said, that he did not baptize in the name of the Father and of the Son, &c.; for which reason the council of Nice ordered those baptized by him to be re-baptized.

Being condemned by Dionysius Alexandrinus in a council, he abjured his errors, to avoid deposition; but soon after he resumed them, and was actually deposed by another council in 269. He may be considered as the father of the modern Socinians; and his errors are severely condemned by the council of Nice, whose creed differs a little from that now used, under the same name, in the church of England. The creed agreed upon by the Nicene fathers, with a view to the errors of Paulus Samosatenus, concludes thus: *τοὺς δὲ λεγούσας ἢ πρὸς οὐκ ἔστιν, καὶ πρὶν γεννηθῆναι, οὐκ ἦν, &c. τοὺς αὐθεματίζει ἡ καθολικὴ καὶ ἀποστολικὴ ἐκκλησία.*—"But those who say he was when he was not, and was not before he was born, the catholic and apostolic church anathematizes." To those who have any veneration for the council of Nice, this must appear a very severe, and perhaps not unjust, censure of the modern Hutchinsonians as well as of the Socinians.

PAULICIANS, a branch of the ancient Manichees, so called from their chieftain, one Paulus, an Armenian, in the seventh century: who with his brother John, both of Samosata, formed this sect; though others are of opinion, that they were thus called from another Paul, an Armenian by birth, who lived under the reign of Justinian II. A certain zealot, called Constantine, revived, in the seventh century, under the government of Constantine, this drooping faction, which had suffered much from the violence of its adversaries, and was ready to expire under the severity of the imperial edicts, and of those penal laws which were executed against its adherents with the utmost rigour. However, the Paulicians, by their number, and the countenance of the emperor Nicephorus, became formidable to all the East.

But the cruel rage of persecution, which had for some years been suspended, broke forth with redoubled violence under the reigns of Michael Curopalates, and Leo the Armenian,

who inflicted capital punishment on such of the Paulicians as refused to return into the bosom of the church.

The empress Theodora, tutress of the emperor Michael, in 845, would oblige them either to be converted, or to quit the empire: upon which, several of them were put to death, and more retired among the Saracens; but they were not all exterminated.

The first religious assembly the Paulicians had formed in Europe is said to have been discovered at Orleans, in 1017, under the reign of Robert; many of whom were condemned to be burnt alive. The ancient Paulicians, according to Photius, expressed the utmost abhorrence of Manes and his doctrine. The Greek writers comprise their errors under the six following particulars. 1. They denied that this inferior and visible world is the production of the supreme Being, and they distinguish the Creator of this world, and of human bodies from the most high God, who dwells in the heavens; and hence some have been led to conceive, that they were a branch of the Gnostics rather than of the Manichæans. 2. They treated contemptuously the virgin Mary, or, according to the usual manner of speaking among the Greeks, they refused to adore and worship her. 3. They refused to celebrate the institution of the Lord's Supper. 4. They loaded the cross of Christ with contempt and reproach; by which we are only to understand, that they refused to follow the absurd and superstitious practice of the Greeks, who paid to the pretended wood of the cross a certain sort of religious homage. 5. They rejected, after the example of the greatest part of the Gnostics, the books of the Old Testament, and looked upon the writers of that sacred history as inspired by the Creator of this world, and not by the supreme God. 6. They excluded presbyters and elders from all part in the administration of the church.—Mosheim's *Eccl. Hist.* vol. ii. p. 178. 8vo.

PAULINA, the wife of the philosopher Seneca, who attempted to kill herself, when Nero had ordered her husband to die. The emperor however prevented her, and she lived some few years after in the greatest melancholy.

PAULINIA, in botany, a genus of the class octandria, order trigynia. Calyx five-leaved; petals four; nectary four-leaved, unequal; capsule turbinate, triangular, three-celled, the cells one-seeded. Fourteen species; natives of the West Indies and South America.

PAULINUS, a bishop who flourished in the early part of the 7th century. He was the apostle of Yorkshire, having been the first archbishop of York. This dignity seems to have been conferred on him about the year 626. He built a church at Almonbury, and dedicated it to St. Alban, where he preached to and converted the Brigantes. Camden mentions a cross at Dewsborough, which had been erected to him with this inscription, *Paulinus*

hic predicavit et celebravit. York was so small about this time, that there was not so much as a small church in it in which king Edwin could be baptized. Constantius is said to have made it a bishopric. Pope Honorius made it a metropolitan see. We are told that Paulinus baptized in the river Swale, in one day, 10,000 men, besides women and children, on the first conversion of the Saxons to Christianity, besides many at Halystone. At Walstone in Northumberland, he baptized Sebert king of the East Saxons. Bede says, "Paulinus coming with the king and queen to the royal manor called Ad-Gebrin (now Yeverin), staid there 36 days with them, employed in the duties of catechizing and baptizing. In all this time he did nothing from morning to night but instruct the people, who flocked to him from all the villages and places, in the doctrine of Christ and salvation; and, after they were instructed, baptizing them in the neighbouring river Glen." According to the same Bede, "he preached the word in the province of Lindissi; and first converted the governor of the city of Lindocollina, whose name was Blecca, with all his family. In this city he built a stone church of exquisite workmanship, whose roof being ruined by long neglect or the violence of the enemy, only the walls are now standing." He is also said to have founded a collegiate church of prebends near Southwell, in Nottinghamshire, dedicated to the Virgin Mary. This church he is said to have built when he baptized the Coritani in the Trent.

Assuming the correctness of the above account, which is taken verbatim from the *Encyclopædia Britannica*, it seems pretty obvious (and it is curious as a matter of fact), that the first archbishop of York baptized men, women, and children, by immersion.

PAULUS ÆMYLIUS, a Roman celebrated for his victories, and surnamed Macedonicus from his conquest of Macedonia. In the early part of life he distinguished himself by his fondness for military discipline. In his first consulship his arms were directed against the Ligurians, whom he totally subjected. When Perseus, king of Macedonia, declared war against Rome, he was again appointed consul in the 60th year of his age, and in a general engagement near Pydna obtained a complete victory. In two days the conqueror made himself master of all Macedonia, and soon after the fugitive monarch was brought into his presence. Paulus did not exult over his fallen enemy. When he had finally settled the government of Macedonia with ten commissioners from Rome, and after he had sacked 70 cities of Epirus, and divided the booty amongst his soldiers, Paulus returned to Rome, where Perseus with his wretched family adorned the triumph of the conqueror. The riches which the Romans derived from this conquest were immense, and the people were freed from all taxes till the consulship of Hirtius and Pansa; but the conqueror himself

was poor, having appropriated for his own use nothing of the treasures except the library of Perseus. He died about 168 years B. C. universally regretted by all the Romans.

PAUNCH. *s.* (*panse*, French; *pantex*, Latin.) The belly; the region of the guts (*Bacon*).

To PAUNCH. *v. a.* (from the noun.) To pierce or rip the belly; to eviscerate; to take out the paunch; to eviscerate (*Garth*).

PAVO. Peacock. In zoology, a genus of the class aves, order gallinæ. Bill convex, robust; head covered with revolute feathers; nostrils large; feathers of the rump long, broad, expansile, and covered with eye-like spots. Four species.

1. *P. cristatus*. Crested peacock. Head with a compressed crest; spurs solitary. Two other varieties.

♂ Cheeks, throat, belly, and wing coverts white.

♀ Body entirely white.

If empire were obtained by beauty, and not by force, the crested peacock, without dispute, would be the king of birds. There is none of the feathered offspring, upon which nature has heaped her treasures with such boundless profusion. Of a tall stature, majestic step, and elegant proportions, every thing belonging to this bird seems to announce a creature of importance and distinction. It is crowned with a fine moveable crest, of the richest hue, which adorns and heightens, without burdening its head. The plumage and tail of this magnificent bird are adorned with colours so rich and various, that no human art can imitate, nor language describe them. When it struts in the sunshine, every moment produces a thousand shades of undulating and evanescent colours, that are continually replaced by other shades, always different, and always admirably beautiful.

But this brilliant plumage, which exceeds the lustre of the finest flowers, fades, like them, every year, and drops in the moulting season; when the poor bird, as if afflicted on account of his loss, and afraid to be seen in so humiliating a condition, always seeks to conceal himself in some gloomy retreat, till the return of spring again restores him his splendid dress. At that season he resumes his station in the open field, to receive the homage due to his beauty; for it is alleged, that nothing so much gratifies his pride as the admiration of his gaudy apparel.

Peacocks, though spread over the greatest part of Europe, came originally from India; where they are found in vast flocks, in some parts of the hither peninsula and the islands of the Indian ocean. So early as the days of Solomon, they were imported into Judea, by the fleets which that monarch equipped upon the Red Sea; and which, in all probability, traded to the coast of Malabar.

Ælian relates, that they were brought into Greece by the barbarians (by whom he means the Asiatics), where they were at first so rare,

that for thirty years after their arrival, they were exhibited at Athens as a show to strangers; and he adds, that multitudes flocked to see them from Lacedemon and Thessaly, who were, each for a certain sum, admitted to the spectacle. This was after the time of Alexander; for that conqueror, though well acquainted with Greece, had never seen them till he marched into India, where he found them flying wild on the banks of the river Hyarotis, and was so struck with their beauty, that he decreed a severe punishment on all who killed or disturbed them. Towards the latter end of his reign they had so greatly multiplied in Greece, that Aristotle, who survived his pupil only two years, speaks of them as birds well known to his countrymen.

The peacock tribe being thus introduced from Asia into Greece, soon spread over the rest of Europe. They have even been carried as far north as Sweden; but in those cold countries they are produced only in small numbers, reared with difficulty, and not without considerable diminution of their beauty. From the great intercourse of the Europeans with America, they are now introduced into almost every part of the new world.

At first the Europeans established them upon the coast of Africa, where they are now domesticated by the princes of those countries, particularly of Congo and Angola. They have been long since transported into Mexico, Peru, and the West India islands, where they never could have appeared but from the aid of man: because, according to a general law of nature, all quadrupeds, and birds of heavy flight, peculiar to the warm climates, cannot, without human assistance, escape from one continent to the other. The short wings, heavy bodies, and embarrassing tail of the peacock, must have for ever debarr'd him from attempting to fly over such an extent of sea.

When the peacock was first brought into Greece, it was only to gratify the eye with the sight of its plumage. The Romans, however, who were richer, and carried by consequence every excess of luxury to a greater length, soon served them up as one of their most delicate dishes. Hortensius, the orator, is said to have first made the peacock an article of food. His example was soon followed by the epicures in Rome, insomuch that the price paid for these birds soon became exorbitant. The luxurious and effeminate emperors that succeeded, refining upon the luxury of former times, took a pride in collecting immense dishes of the heads or brains of peacocks; dainties which had nothing to recommend them but the prodigious expence at which they were provided. The same thing may be said of their flesh, which is hard and dry. But probably the Roman cookery, which was carried to a very high degree of perfection, might compensate for these defects. Only the young at present are deemed good eating: the old are seldom dressed, except at some formal and splendid feast. In France, they were formerly served up with all their plumage, merely for show; a

purpose for which they are perfectly suited, as their flesh is said to remain unaffected by corruption for a longer period than that of most birds.

It is not till the third year that the males are at their full size and vigour. Then their feathers are all in perfection; and the superfluous nourishment, having nothing farther to add to the individual, is employed in reproducing the species. The female, soon after fecundation, lays her eggs in some retreat where she may be concealed from the male, who would destroy them were he to discover her charge. In these northerly climates she lays only from four to five eggs; but in Greece, according to Aristotle, she produced twelve, and in India sometimes lays twice that number, so powerfully does climate operate upon the fertility of birds of this, and perhaps of every genus. In these countries also, the female, when deprived of the male, will produce barren eggs, which by the ancients were denominated zephyrian, as supposing them to be the result of the warm stimulus of the vernal gales.

The young, when excluded, are fed with crumbs of bread, cheese, and grass. The ancients paid very particular attention to the rearing of these birds: they put each of the young ones into a separate cage, to prevent them from fighting. The male does not recognize the young for his own till after they have got the crest; before that time he chases them like strangers.

The peacock, like all other birds of the poultry kind, feeds upon grain; but it is extremely capricious, and there is hardly any kind of food which it will not, at times, covet and pursue. Insects and tender plants are often eagerly sought for, at a time when it has a sufficiency of its natural food at hand. In the indulgence of these irregular appetites, walls cannot easily confine it. It strips the tops of houses of their tiles and thatch; it lays waste the labours of the gardener; roots up his choicest seeds; and nips his favourite flowers in the bud. Thus, its beauty but ill compensates for the mischief it occasions; and many of the more homely looking fowls are very deservedly preferred to it.

The cry of the peacock, which is harsh and disagreeable, is rendered still more intolerable, by the time in which it is most frequently uttered. It perches upon the house tops, and, in the dead of night, often interrupts the repose of other animals by those hideous screams, from which Varro alleges it derived its Latin name. (*Volucres pleræque a suis vocibus appellatæ; ut hæ, upupa, cuculus, ulula, pavo. De lingua Latina, Lib. iv.*) According to Ælian's account, adopted by Willoughby, the peacock lives no less a period than an hundred years. Aristotle and Pliny, however, assign it the more moderate space of twenty-five, a longevity which accurate observations would probably confirm.

As it is only in India that these birds are found in their natural freedom; so it is there

also that the inhabitants have invented a method of hunting them. Although they are spread in vast flocks over the fields, there is no possibility of approaching them by day, so quickly do they penetrate the thickets, where they cannot be pursued. In the kingdom of Cambaya, where this diversion is practised, the fowler observes the trees upon which they perch; and in the night approaches them with a kind of banner, upon each side of which a peacock is painted to the life. A lighted torch is placed upon the top of this decoy; and the peacock, when disturbed, flies to what it takes for another bird of its kind, and is caught in a noose placed there for that purpose.

Of the origin of the white varieties of this species we are ignorant. The hare and the ermine become in some countries white from the coldness of the climate, but resume their natural colour when transported into a warmer latitude. This fact however does not hold with respect to the white peacock, for it produces a constant race of the same colour; and its eggs, though transported into the most sultry climes, will yield birds of the parent hue.

This whiteness of plumage has justly been deemed by naturalists the effect of migration. Norway, and the other countries of the north, have given birth to this species, for there they are found wild; and from these frozen regions they annually retire to spend the winter in Germany. Whether this species was introduced into the north of Europe by a voluntary migration from Asia, or by the intervention of man, is a point which cannot now be determined. It is probable that it was wholly unknown to the ancients, since no mention is made of it in any of their writings; and it is to be presumed also, that its migration into the north is not very ancient, for, though now common there, it was deemed extremely rare by all former naturalists.

The feathers of these varieties, though white, still retain some shades of their primitive lustre. Those of the tail, particularly, show some faint traces of that beautiful eye, which sparkles at the end of each feather in the common variegated species. It is probable, that were this bird removed into the milder regions of Asia, its original colours would return in a few generations.

2. *P. bicalcaratus*. Iris peacock. Brown; head subcrested; spurs two. Bill blackish, the upper mandible from the nostrils to the tip red; irides yellow; crown black; face naked; temples white; neck shining brown with black lines; upper part of the back, shoulders, and wing coverts brown, with yellowish stripes, the feathers near the tip with a large purple-gold spot; lower part of the back and rump spotted with white; body beneath brown, with transverse black streaks; quill-feathers dusky; legs brown. Inhabits China: rather larger than the pheasant.

3. *P. Thibetanus*. Thibet peacock. Cinereous streaked with blackish; head subcrested; spurs two; wing-coverts, back, and

rump, grey, with small white spots, besides which the coverts have shining blue spots. Inhabits Thibet; twenty-five and a half inches long.

4. *P. muticus*. Japan peacock. Head with a subulate crest; spurless; body blue mixed with green; head and neck greenish, with blue spots, and a white streak down the middle. Inhabits Japan: size that of *P. cristatus*.

PAVO, in astronomy, a constellation of the southern hemisphere, unknown to the ancients, and not visible in our latitudes. It consists of 14 stars, which, arranged according to their magnitudes, are 0, 1, 3, 5, 4, 1.

PAVONIA, in botany, a genus of the class monadelphia, order polyandria. Calyx double, the outermost many-leaved; stigmas ten; capsules five, two-valved, one-seeded. Fifteen species; natives of the Indies; and several of them formerly, but erroneously, ranged under the genus *hibiscus*, as some few were under that of *urena*.

PAVOR, an emotion of the mind which received divine honours among the Romans. Tullus Hostilius, the third king of Rome, was the first who built her temples, and raised altars to her honour, as also to Pallor, the goddess of paleness.

PAUPER. *s.* (Latin.) A poor person; one who receives alms.

PAUSANIAS. There were many of this name, the most remarkable of whom are the following: 1. A Spartan general, who greatly signalized himself at the battle of Platæa, against the Persians. He was afterwards set at the head of the Spartan armies, and extended his conquests in Asia, but his haughtiness created him many enemies. Pausanias was dissatisfied with his countrymen, and he offered to betray Greece to the Persians, if he received in marriage, as the reward of his perfidy, the daughter of their monarch. His intrigues were discovered by means of a youth intrusted with his letters to Persia. The letters were given to the ephori of Sparta, and the perfidy of Pausanias laid open. He fled for safety to a temple of Minerva, which was surrounded with heaps of stones, the first of which was carried there by his own mother. He was starved to death in the temple, and died about 471 years before the Christian era.—2. Another at the court of king Philip of Macedon, who stabbed Philip as he entered a public theatre. After this bloody action, he attempted to make his escape, but was pursued by Aitalus and Perdicas, friends of Philip, who fell upon him, and immediately dispatched him: Some suppose that Pausanias committed this murder at the instigation of Olympias, the wife of Philip, and of her son Alexander.—3. A celebrated orator and historian, who settled at Rome A. D. 170, where he died in a very advanced age. He wrote an history of Greece in ten books, in the Ionic dialect, in which he gives with great precision and geographical knowledge an account of the situation of its different cities; their antiquities, and the several curiosities which they contained. He has

also interwoven mythology, in his historical account, and introduced many fabulous traditions and superstitious stories.—4. There was another Pausanias, a native of Cæsaræa, in Cappadocia, who wrote some declamations, and who is often confounded with the historian of that name.

PAUSE. *s.* (*pausa*, low Latin; *παυω*.) 1. A stop; a place or time of intermission (*Addison*). 2. Suspense; doubt (*Shakspeare*). 3. Break; paragraph; apparent separation of the parts of a discourse (*Locke*). 4. Place of suspending the voice marked in writing, thus —.

PAUSES or **RESTS**, in speaking or reading, are a total cessation of the voice, during a perceptible, and in many cases a measurable space of time. There are two kinds of pauses; first, emphatical pauses; and next, such as mark the distinctions of sense. See **READING**.

PAUSE, in music, a mark, or character, consisting of a curve drawn over a dot, and signifying that the note, or the rest, over which it is placed, is to be continued beyond the regular time. The exact length of the pause is not dictated by any stated rule, but left to the judgment, taste, and feeling of the performer, who sometimes is licensed by the words *ad libitum* to introduce extempore embellishments. See **MUSIC**.

To PAUSE. *v. n.* 1. To wait; to stop; not to proceed; to forbear for a time (*Milton*). 2. To deliberate (*Knolles*). 3. To be intermitted (*Tickel*).

PAUSER. *s.* (from *pause*.) He who pauses; he who deliberates (*Shakspeare*).

PAUSIAS, a painter of Sicily, who lived about 350 years B.C. He was the first who understood how to apply colours to wood or ivory, by means of fire. He made a beautiful painting of his mistress Glycere, which was bought by Lucullus for two talents.

PAUSUS. In zoology, a genus of the class insecta, order coleoptera. Antennas two-jointed; the upper joint very large, inflected, hooked, pedicellate; head pointing forwards with a convex jugular triangle; thorax narrow, unequal, scutellate; shells flexile, deflected, truncate; fore-feet placed at the fore-part of the breast; thighs with minute appendages, tarsi four-jointed. Five species, all exotics: the following are chiefly entitled to notice.

1. *P. sphærocerus*. Head horned; club globular; shells shorter than the abdomen, punctured; shanks dilated at the tip: body polished, chesnut; thorax the same breadth as the head: wings shining, of changeable violet. It inhabits Sierra Leona; wanders about in the night during the months of January and February, and becomes blind or benumbed on the approach of light: the globes of the antennas give a kind of phosphoric light in the dark.

2. *P. microcephalus*. Head unarmed; body an oblong sphere, dark chesnut-brown; shells as long as the body, not punctured; shanks linear; shield two-parted; pivots of the antennas black, upper joint of the club

much larger than the head; wings sooty. Inhabits the Bananas and neighbouring islands.

PAW. *s.* (*pawen*, Welsh; *patte*, French.) 1. The foot of a beast of prey (*More*). 2. Hand: in contempt (*Dryden*).

To PAW. *v. n.* (from the noun.) To draw the forefoot along the ground (*Pope*).

To PAW. *v. a.* 1. To strike with a drawn stroke of the fore-foot (*Tickel*). 2. To handle roughly. 3. To fawn; to flatter (*Ainsworth*).

To PAW THE GROUND. A horse is said to paw the ground, when his leg being either tired or painful, he does not rest it upon the ground. Spirited horses are also said to paw the ground when they shew an impatience to go on by throwing out one of the fore feet repeatedly.

PAWED. *a.* (from *paw*.) 1. Having paws. 2. Broad-footed.

PAWLE, in a ship, a small piece of iron bolted to one end of the beams of the deck, close to the capstan; but yet so easily, as that it can turn about. Its use is, to stop the capstan from turning back, by being made to catch hold of the whelps: they therefore say, heave a pawle; that is, heave a little more, for the pawle to get hold of the whelps; and this they call pawling the capstan.

PAWN. *s.* (*pand*, Dutch; *pan*, French.) 1. Something given to pledge as a security for money borrowed or promise made (*Howel*). 2. The state of being pledged (*Shakspeare*). 3. A common man at chess (*Cowley*).

PAWN, a pledge lodged for the security of the payment of a sum of money borrowed. As the party that pawns the goods has a general property therein, they cannot be forfeited by the person that has them in pawn, for any offence of his: neither can they be taken in execution for his debt: on the other hand, where goods are repawned for money, if after judgment is obtained against the pawnor for debt, the goods in the pawnee's hands are not liable to execution until such time as the money lent is paid to the pawnee. He that borrows money on a pawn is to have again the pledge, when he repays the same, or he may bring an action for detaining it; and his very tender of the money revests the special property in him. Likewise it has been held, that where a broker refuses, on tendering the money, to redeliver the goods, he thereupon shall be indicted. In case goods are pawned for lent money, and no day fixed for their redemption, they are said to be redeemable at any time during the pawnor's life; and though they may not be redeemed after his death, they may after the death of the pawnee. Where the pawn is redeemable on a certain day, it must be strictly observed, or upon failure of payment it may be sold. Also it is the common practice of the brokers, when no day is fixed for redemption, not to stay longer than a year for their money, at the expiration of which time they usually sell the goods. See also 39 and 40 Geo. III. c. 99.

To PAWN. *v. a.* (from the noun.) To pledge; to give in pledge (*Shakspeare*).

PA'WNBROKER. *s.* (*pawn and broker.*) One who lends money upon pledge (*Arbutnot*).

PAX, an allegorical divinity among the ancients. The Athenians raised her a statue, representing her as holding Plutus, the god of wealth, in her lap, to intimate that peace gives rise to opulence. She was represented among the Romans with the horn of plenty; and also carrying an olive branch in her hand. The emperor Vespasian built her a celebrated temple at Rome, which was consumed by fire in the reign of Commodus.

PAXU, an island in the Mediterranean sea, a little to the S. of that of Corfu, about 15 miles in circumference. It is part of the republic of Seven Islands, and produces wine, oil, and almonds. San Nicolo is the only town, and has a good harbour. Lon. 20. 0 E. Lat. 39. 12 N.

To PAY. *v. a.* (*paier*, French.) 1. To discharge a debt (*Dryden*). 2. To dismiss one to whom any thing is due with his money: as, *he had paid his labourers*. 3. To atone; to make amends by suffering (*Roscommon*). 4. To beat (*Shakspeare*). 5. To reward; to recompense (*Dryden*). 6. To give the equivalent for any thing bought (*Locke*).

PAY. *s.* (from the verb.) Wages; hire; money given in return for service (*Temple*).

PAY'ABLE. *a.* (*païable*, French.) 1. Due; to be paid (*Bacon*). 2. Such as there is power to pay (*South*).

PAY'DAY. *s.* (*pay* and *day*.) Day on which debts are to be discharged, or wages paid.

PAY'ER. *s.* (*paieur*, French.) One that pays.

PAYMASTER. *s.* (*pay* and *master*.) One who is to pay; one from whom wages or reward is received (*Taylor*).

PAYMENT. *s.* (from *pay*.) 1. The act of paying (*Bacon*). 2. The thing given in discharge of debt or promise (*Bacon*). 3. A reward (*South*). 4. Chastisement; sound beating (*Ainsworth*).

PAYS (*René le*), a French poet, controller of the imposts of Dauphiné and Provence, was the favourite of the ladies, by his miscellanies, called *amitiés, amours, & amourettes*, published 1685. He died 1690. He wrote besides *Zelotide*, a romance, colloquies, sonnets, &c.

PAYS DE VAUD, a new canton of Switzerland, extending along the lake of Geneva, and rising gradually from the edge of that lake. It is richly laid out in vineyards, corn-fields, and meadows, and chequered with many villages and towns. Lausanne is the capital.

To PAYSE. *v. n.* (used by *Spenser* for *poize*.) To balance.

PAY'SER. *s.* (for *poizer*.) One that weighs (*Carew*).

PAZ, a city of Peru, capital of a province of its name, in the audience of Charcos, and an archbishop's see. Beside the cathedral, it contains four churches, an hospital, a college,

and several convents. It is seated at the foot of a mountain, in a valley abounding in wine and fruits, 220 miles N.W. of Plata. Lon. 68. 50 W. Lat. 17. 0 S.

PAZZI (James), a banker of Florence. He headed the faction which opposed the Medicis, and conspired to cut off the two brothers, Julian and Laurent, and to seize upon the sovereign power. The elevation of the host, 1478, was the signal for this murderous action, and at the moment of this solemn ceremony, Julian was stabbed to the heart by a brother of Pazzi; but Laurent escaped with a slight wound. The popularity of the Medicis, and the atrocity of the deed, armed the people in their favour, and the conspirators were seized, and punished with death. The house of the Pazzis was afterwards allied to the Medicis by marriage.

PEA, in botany. See **PISUM**.

PEA (Crown). See **PISUM**.

PEA (Everlasting). See **LATHYRUS**.

PEA (Heart). See **CARDIOSPERMUM**.

PEA (Heath). See **OROBUS**.

PEA (Painted Lady). See **LATHYRUS**.

PEA (Pigeon). See **CYTISUS**.

PEA (Scarlet). See **LATHYRUS**.

PEA (Sweet). See **LATHYRUS**.

PEA (Tangier). See **LATHYRUS**.

PEA (Winged). See **LOTUS**.

PEA (Wood). See **OROBUS**.

PEACE. *s.* (*paix*, French; *pax*, Latin.) 1. Respite from war (*Addison*). 2. Quiet from suits or disturbances (*Davies*). 3. Rest from any commotion. 4. Stillness from riots or tumults (*Shakspeare*). 5. Reconciliation of differences (*Isaiah*). 6. A state not hostile (*Ba.*). 7. Rest; quiet; content; freedom from terror; heavenly rest (*Tillotson*). 8. Silence; suppression of the thoughts (*Dryden*).

PEACE, in law, signifies a quiet and harmless behaviour towards the king and his people. The king, by his office and dignity royal, is the principal conservator of the peace within all his dominions, and may give authority to any other to see the peace kept, and to punish such as break it: hence it is usually called the king's peace. All the great officers of state are generally conservators of the peace throughout the kingdom, and may commit all breakers of it, or bind them in recognizance to keep it. Also the sheriff, coroner, constables, and tithingmen are conservators of the peace within their own jurisdiction; and may apprehend all breakers of the peace, and commit them till they find sureties to keep the peace. 1 Black. 350.

PEACE (Justices of the), are persons appointed by the king's commission to attend to the peace of the county where they dwell. They were called guardians of the peace till the 36th year of Edw. III. c. 12, where they are called justices.

A justice of the peace must, before he acts, take the oath of office, which is always done at the general quarter sessions for the county, by virtue of a *dedimus potestatem* out of chancery.

Sheriffs, coroners, attorneys, and proctors, may not act as justices of the peace.

The power, office, and duty of this magistrate extends to an almost infinite number of instances, specified in some hundreds of acts of parliament, and every year accumulating.

The commission of the peace does not determine by the demise of the king, nor until six months after, unless sooner determined by the successor: but before his demise, the king may determine it, or may put out any particular person; which is most commonly done by a new commission, leaving out such person's name.

Justices of the peace can only be appointed by the king's special commission, and such commission must be in his name; but it is not requisite that there should be a special suit or application to, or warrant from, the king for the granting thereof, which is only requisite for such as are of a particular nature; as constituting the mayor of such a town, and his successors, perpetual justices of the peace within their liberties, &c. which commissions are neither revocable by the king, nor determinable by his demise, as the common commission of the peace is, which is made of course by the lord chancellor, according to his discretion. 1 Lev. 219.

The form of the commission of the peace, as it is at this day, was, according to Hawkins, settled by the judges about the 23 Eliz. 4 Inst. 471.

Qualifications.—On renewing the commission of the peace (which generally happens when any person is newly brought into the same), a writ of *dedimus potestatem* is issued out of chancery to take the oath of him who is newly inserted, which is usually in a schedule annexed; and to certify the same into that court at such a day as the writ commands. Unto which oath are usually annexed the oaths of allegiance and supremacy. Lamb. 53.

Jurisdiction.—It seems now to be settled, that justices of the peace have no power to hear and determine felonies, unless they are authorized so to do by the express words of their commissions; and that their jurisdictions to hear and determine murder, manslaughter, and other felonies and trespasses, is by force of the word *assignavimus* in their commission, which gives them, or two of them (whereof one is of the quorum), power to hear and determine felonies, &c. 2 Haw. P. C. 38. And hence it has been lately adjudged, that the caption of an indictment of trespass before justices of the peace, without adding *neon ad diversas felonias*, &c. assignant, is naught. Trin. 7 G. 1. in B. R. But though justices of the peace, by force of their commission, have authority to hear and determine murder and manslaughter, yet they seldom exercise a jurisdiction herein, or in any other offences in which clergy is taken away, for two reasons: 1. By reason of the monition and clause in their commission, viz. in cases of difficulty to expect the presence of the justices of assize. 2. By the direction of the statute of 1 and 2 P. and M. c. 13, which directs justices of the peace in case of man-

slaughter and other felonies, to take the examination of the prisoner, and the information of the fact, and put the same in writing; and then to bail the prisoner if there is cause, and to certify the same with the bail at the next general gaol-delivery; and therefore in cases of great moment they bind over the prosecutors, and bail the party, if bailable, to the next general gaol-delivery; but in smaller matters, as petty larceny, and in some other cases, they bind over to the sessions; but this is only in point of discretion and convenience, not because they have not jurisdiction of the crime.

As to inferior offences, the jurisdiction herein given to justices of the peace by particular statutes is so various, and extends to such a multiplicity of cases, that it would be endless to endeavour to enumerate them. 6 Mod. 128. It has been held, that not only assaults and batteries, but libels, barratry, and common night-walking, and haunting bawdy-houses, and such like offences, which have a direct tendency to cause breaches of the peace, are cognizable by justices of the peace, as trespasses within the proper and natural meaning of the word. 1 Lev. 139.

Duty.—Justices of the peace are to hold their sessions four times in the year, viz. the first week after Michaelmas, the Epiphany, Easter, and St. Thomas. They are justices of record; for none but justices of record can take a recognizance of the peace. Every justice of the peace has a separate power, and may do all acts concerning his office apart and by himself, and even may commit a fellow-justice upon treason, felony, or breach of the peace; and this is the ancient power which conservators of the peace had at common law. By several statutes justices may act, in many cases, where their commission does not reach; the statutes themselves being a sufficient commission. Wood, Inst. 79, 80.

Justices of the peace are authorised to do all things appertaining to their office, so far as they relate to the laws for the relief, maintenance, and settlement of the poor; for passing and punishing vagrants; for repair of the highways; or to any other laws concerning parochial taxes, levies, or rates; notwithstanding they are rated or chargeable with the rates, with any place affected by such their acts. Provided that this shall not empower any justice for any county at large to act in the determination of any appeal to the quarter-sessions of such county, from any order, matter, or thing, relating to any such parish, township, or place where such justice is so charged or chargeable. 16 Geo. II. c. 18.

PEACE. interjection. A word commanding silence (*Crashaw*).

PEACE-OFFERING: *s.* (*peace and offer*.) Among the Jews, a sacrifice or gift offered to God for atonement and reconciliation for a crime or offence (*Leviticus*).

PEACEABLE. a. (*from peace*;) 1. Free from war; free from tumult (*Swift*). 2. Quiet;

undisturbed (*Spenser*). 3. Not violent; not bloody (*Hale*). 4. Not quarrelsome; not turbulent (*Shakspeare*).

PEACEABLENESS. *s.* (from *peaceable*.) Quietness; disposition to peace (*Hammond*).

PEACEABLY. *ad.* (from *peaceable*.) 1. Without war; without tumult (*Swift*). 2. Without tumults or commotion (*Swift*). 3. Without disturbance (*Shakspeare*).

PEACEFUL. *a.* (*peace and full*.) 1. Quiet; not in war (*Dryden*). 2. Pacific; mild (*Dryden*). 3. Undisturbed; still; secure (*Pope*).

PEACEFULLY. *ad.* (from *peaceful*.) 1. Without war. 2. Quietly; without disturbance (*Dryden*). 3. Mildly; gently.

PEACEFULNESS. *s.* (from *peaceful*.) Quiet; freedom from war or disturbance.

PEACEMAKER. *s.* (*peace and maker*.) One who reconciles differences (*Shakspeare*).

PEACEPARTED. *a.* (*peace and parted*.) Dismissed from the world in peace (*Shakspeare*).

PEACH-TREE, in botany. See AMYGDALUS.

PEACH (Wolf's). See SOLANUM.

PEACH, in mineralogy, chlorite, a species of talc. See TALCUM.

To PEACH. *v. n.* (corrupted from *impeach*.) To accuse of some crime (*Dryden*).

PEACH-COLOURED. *a.* (*peach and colour*.) Of a colour like a peach (*Shakspeare*).

PEACHICK. *s.* (*pea and chick*.) The chick of a peacock (*Southern*).

PEACOCK, in ornithology. See PAVO.

PEAHEN, the female of the bird pavo.

PEAK. *s.* (*peac*, Saxon.) 1. The top of a hill or eminence (*Prior*). 2. Any thing acuminated. 3. The rising forepart of a headdress.

To PEAK. *v. n.* 1. To look sickly (*Shakspeare*). 2. To make a mean figure; to sneak (*Shakspeare*).

PEAK, a mountainous district in the N.W. part of Derbyshire, which abounds in lead, iron, millstones, marble, alabaster, coal, and a coarse sort of crystals. It is much visited on account of its extraordinary caverns, perforations, and other curiosities. The Wonders of the Peak have been celebrated both in prose and verse; and they are noticed in this work under the articles BUXTON, CASTLETON, CHATSWORTH, and TIDESWELL.

PEAK OF TENERIFFE. See TENERIFFE.

PEAL. *s.* A succession of loud sounds: as of bells, thunder, cannon (*Hayward*).

To PEAL. *v. n.* (from the noun.) To play solemnly and loud (*Milton*).

To PEAL. *v. a.* To assail with noise (*Milton*).

PEAR (Avocado). See LAURUS.

PEAR (Prickly). See CACTUS.

PEAR (Garlic). See CRATEVA.

PEARCE (Zachary), son of a distiller in Holborn, was educated at Westminster school and Trinity college, Cambridge. Distinguished at the university, and by some entertaining papers in the Guardian and the Spectator, he was patronized by Parker, earl of Macclesfield, to

whom he dedicated his edition of Longinus, and from whom he obtained preferment. In 1739 he was made dean of Winchester, in 1748 bishop of Bangor, and in 1756 bishop of Rochester, and dean of Westminster. These last honours were unsolicited, and the bishop, who longed for the privacy of retired life, was anxious to resign; but he was permitted to divest himself only of the deanery of Westminster, in favour of Dr. Thomas. He died 1774. Dr. Pearce was eminent for his classical knowledge. He wrote a vindication of the miracles against Woolston, besides an account of Trinity college, Cambridge—letters against Conyers Middleton, &c.—a review of Milton's text—an essay on the origin of temples—sermons, &c. After his death appeared his commentary on the four evangelists, and the acts, 2 vols. 4to.—and 4 vols. of sermons, 8vo.

PEARCH. See PERCA and PERCH.

PEARL, in natural history, a hard concretion, of a brilliant silvery, or bluish white colour, found in some species of the oyster and muscle. See MARGARITA, OSTREA, and MYTILUS.

Pearls, though esteemed of the number of gems by our jewellers, and highly valued, not only at this time but in all ages, are supposed to proceed from a distemper in the creature that produces them, analogous to the bezoars and other stony concretions in several animals of other kinds.

The fish in which these are usually produced is the East Indian pearl-oyster, as it is commonly called. Besides this shell, there are many others that are found to produce pearls; as the common oyster, the muscle, and several others; the pearls of which are often very good; but those of the true Indian berberi, or pearl-oyster, are in general superior to all. The small or seed-pearls, also called ounce-pearls, from their being sold by the ounce and not by tale, are vastly the most numerous and common; but, as in diamonds, among the multitudes of small ones, there are smaller numbers and larger found, so in pearls there are larger and larger kinds; but as they increase in size, they are proportionably less frequent; and this is one reason of their great price. We have Scotch pearls frequently as big as a little tare, some as big as a large pea, and some few of the size of a horse bean; but these are usually of a bad shape, and of little value in proportion to their weight. Philip II. of Spain had a pearl perfect in its shape and colour, and of the size of a pigeon's egg. The finest, and what is called the true shape of the pearl, is a perfect round; but if pearls of a considerable size are of the shape of a pear, as is not unfrequently the case, they are not less valued, as they serve for ear-rings and other ornaments. Their colour ought to be a pure white; and that not a dead and lifeless, but a clear and brilliant one: they must be perfectly free from any foulness, spot, or stain; and their surfaces must be naturally smooth and glossy; for they bring their

natural polish with them, which art is not able to improve.

All pearls are formed of the matter of the shell, and consist of a number of coats spread with perfect regularity one over another, in the manner of the several coats of an onion, or like the several strata of the stones found in the bladders or stomachs of animals, only much thinner.

PEARL (Mother of), is the shell, not of the pearl oyster, but of another sea fish of the oyster kind. This shell is extremely smooth on the inside, and of the whiteness and water of pearl itself: it has a like lustre on the outside, after the first laminæ or scales have been cleared off with aquafortis and the lapidaries mill. Mother of pearl is used in inlaid works, and in several toys, as snuff-boxes, &c.

PEARL, in heraldry, in blazoning with precious stones, is the same with argent, or white.

PEARL ASH, an alkali used in various manufacturing processes: it is potash mixed with different heterogeneous substances. See **POT-ASH**.

PEARL BARLEY. See **HORDEUM**.

PEARL SPAR, in mineralogy, a name given to a species of iron ore, and of spar: see the articles **FERRUM** and **SPATHUM**.

PEARL FISHERY. The most important fishery to England at present is that at Ceylon. The origin of this method of procuring a valuable ornament for the person must have arisen from accidentally discovering the pearl within oysters taken for food is evident; but it is impossible to ascertain when the search became systematical, though it is extremely probable it has been so for very many ages.

The pearl oysters of the coast of Ceylon are all of one species, and possess the same regularity of form; but they assume different qualities, and have different denominations, suited to the nature of the ground where they are situated, and from the appearance of zoophytes adhering to the external surface of their shells. See **MYTILUS MARGARITIFERUS**.

They resemble a cockle in shape, which is an imperfect oval, and their circumference is generally about nine inches and a half, having a segment as it were cut off where the joint of the two shells occurs. The interior of those is far more brilliant and beautiful than the pearl they enclose, and the outside is smooth, except when injured by the usurpations of sponges, corals, and other marine productions. The flesh of the animal is white, and of a glutinous consistency.

Perhaps no class of animated nature undergoes more unmerited persecution and destruction than the pearl-oyster; when situated in their native regions, they afford a foundation for the habitations of other animals, and millions of them are dragged from their banks, and thrown away, for what they are vainly supposed to contain, and that an intruder or a disease. One of the banks at Ceylon furnishes oysters to which zoophytes are attached, apparently belonging to the class of sponges, and those generally resemble a funnel or cup, and grows

to a size that completely overshadows the oyster; others of different banks have a substance adhering to them tinged with red. The above are found to contain the finest pearls: some escape free from incumbrance, and thousands are compelled to bear trees of coral on them of five times their own weight.

The oyster is fastened to the rocks at the bottom of the sea by quantities of hairy fibres. By this means they are not readily swept from their original station, and yet possess the advantage of being conveyed to some distance from it by the motion of the water; besides they are connected to each other in the same manner. It frequently happens that an old oyster, surrounded by young ones, is brought up by the divers, and the latter have been ascertained to possess, even when little larger than a grain of sand, the power of moving themselves by the extension and contraction of what is termed the beard. The violence of the waves at the time of the monsoons occasions great changes in the state of the banks, when incredible numbers of them are buried by the shifting of sand, and that is sometimes removed by the same power acting in a contrary direction.

It is supposed, from many concurring circumstances, that the pearl-oyster arrives at maturity at the close of seven years; after this period it is imagined that it dies, when the body decaying is washed away by the sea: a bed was discovered a few years since composed almost wholly of empty shells. The precious substance, which invites the exertions of man to obtain it, has been generally supposed to be a disease peculiar to the animal; but were this the fact, it is extremely prevalent amongst this description of oysters, as every individual of the species is found to be accompanied by a certain proportion of minute particles, which are evidently the pearl in the first stages of formation; hence it may be fairly supposed, that they are in some essential degree useful, rather than prejudicial to the inhabitant of the shells, of the nature of which it decidedly partakes, and is composed of a number of layers, moveable by a skilful person to the improvement of the pearl, as it sometimes happens the exterior coat only may be discoloured or injured. When the pearl is in a state of perfection they are of a brilliant white, some have been found of a beautiful tint of pink, of the colour of gold, and a few entirely black. These variations are, however, very uncommon.

The pearls are discovered near the angles of the shell, and close to the hinge, where the animal is most thick and fleshy; they are generally numerous, and in some instances 150 have been taken from one oyster; on the other hand, an hundred oysters have been opened whence a pearl could not be extracted fit for any purpose whatever.

Attempts were made some years past to transplant this species of oysters, but without success, as they invariably died during their transportation.

The first step previously to a fishery is the

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examination of the banks, which takes place at the end of October, during the short interval of fine weather usual between the close of the south-west monsoon and the commencement of the north-east. One pilot, two divers, and eight or more sailors, to each boat, are employed upon this service, and there are generally nine boats. The superintendant on the part of government accompanies the principal arripaana, or pilot, who is taught his profession from his infancy, inheriting it from his father, in the manner of most occupations in the East. The boats visit the banks in a body, and the divers frequently descending, ascertain its exact position, and at the same time bring up a thousand or more oysters as specimens, which are examined by persons who, from experience, are enabled to judge whether it is probable they are of an age calculated to answer the purposes of the intended fishing: this examination is not, however, deemed sufficient, and the oysters are opened, when the pearls are extracted, and after sorting them they are valued. It is really shocking to humanity to reflect, that if one thousand oysters produce as many pearls as are worth three pounds sterling, the fishery is undertaken, as it has been found that the examination of that number is a sufficient designation of success, or the reverse.

In the progress of this preliminary part of the undertaking, the oysters are found at various periods of their growth: those not more than one year old are very small, being less than an inch in circumference, and the full grown oysters are as large as the palm of the hand of a man: between the ages of four and five years the seed pearl only is discovered; but after this period they increase in size very rapidly; and, as has been before observed, they die after the eighth year. After completely satisfying themselves as to the probability of future success, the result is published, for the information of those who may be inclined to partake of the probable advantages. Since the island of Ceylon has been a part of the British empire, each fishing season has either been reserved for the exclusive use of government, or rented to speculative persons: but the produce has never amounted to 200,000*l.* on any one occasion. The most common practice is to farm the season to an individual, who lets the right of partaking to others.

The fourteen banks, or beds, on which the oysters are found, are situated in the bottom of the gulph of Manaar, and are included in a space about thirty miles in length, from north to south, and twenty-four in breadth. It has been ascertained, that the largest of those beds is ten miles long, and two broad; the remainder are much smaller; nor are they all equally productive, as it seldom happens that more than three beds can be marked for use in any given season. The spots where the oysters lay are not raised higher than the surrounding parts, except by their accumulation, and the coral rocks, on which the most valuable are placed, are on a level with the sand: the depth

of water over them varies from eighteen to ninety feet, and the most convenient and best fishing is at the depth of between six and eight fathoms. When it is thought proper to undertake a fishery, advertisements are issued in the English and Malabar languages, inviting the possessors of boats suited for the purpose, and all divers, to meet on the 20th of February in the bay of Condaatchy: vessels of this description assemble from various places on the coast of Coromandel, completely equipped, and furnished with every necessary for the accomplishment of their intentions: those are open, of about one ton burthen, forty-five feet in length, seven or eight wide, and three deep in the hold; and are so constructed as to draw not more than eight or ten inches water, unless they are heavily laden, and are navigated with one sail only. They have a complement of twenty-three men, whose employments are thus appropriated: one pilot, one man for the helm; another to take care of the boat; one to lade out water; ten divers; ten mundrees, who haul up the divers, the stones, and the baskets: and a peon attends on the part of the renter, to take care that his interests do not suffer from fraud.

A second examination of the banks takes place a few days before the operations begin, which is merely for the purpose of anchoring buoys to point out the situation of the banks, and those parts of them most abounding with the object of search. A small sloop is from the first stationed in the centre of the banks, where she remains for the double purpose of guarding the buoys, and as a guide to the boats. The pilot boats make a circuit of twelve or fifteen miles round the sloop, sounding and sending down the divers, and upon discovering a place remarkable for the number of oysters, a buoy is immediately placed over it, which consists of triangular rafts of wood, fastened by a cable attached to a wooden anchor, sunk by two stones. The rafts support flags of various colours; and drawings of those are inserted in a book, where a minute description is given of the name, quality, and age, of the oysters on the bank under each flag. Three hours sailing of the boats employed in the pearl fishery from the shore of Condaatchy, or a distance of about fifteen miles, occurs between the banks and that place: unfortunately the land near them is so low, that it is impossible to make use of it in ascertaining their position; it becomes, therefore, absolutely necessary to renew at each fishery the fatiguing operation of sounding and diving, the buoys being all removed at the close of their labours, as they would serve to point out the places for depredators to dive with success.

Mr. Cordiner, from whose late interesting account of Ceylon we have extracted most of the preceding particulars, says, "As the boats arrive at Condaatchy to be employed in the fishery, they are regularly numbered, and their description and the names of their crew are registered in a book. The fishery for the season of 1804 was let by government to a native

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of Jaffnapatam, who had resided for some years previously to it on the coast of Coromandel. For thirty days fishing, with 150 boats, he came under an obligation to pay 300,000 Porto Novo pagodas, or 120,000l. sterling. He sold the right of fishing to some of the best equipped boats for 3000. pagodas each, and that of others for 2500; but kept by far the greater part of them to fish on his own account."

After every arrangement is completed, and the boats are ready to put to sea, their navigators and the divers are roused from their slumbers by the discharge of a cannon, the sounding of horns, and the beating of a kind of drum, called by the natives *tom toms*: this signal is generally made rather before midnight, when a breeze from the land prevails; the confusion that immediately follows the movements of upwards of six thousand persons in the dark may be better conceived than described; but in defiance of every obstacle, these silly people will not depart till they have performed certain ablutions and incantations, calculated, as they suppose, to forward their views. When they have reached the banks they cast anchor, and wait the approach of day; which no sooner arrives than each boat takes its station: at six or seven o'clock the diving commences. To facilitate this operation, a species of open scaffolding is projected from each side of the vessel, and it is from the scaffold the tackle is suspended, three stones on one side and two on the other. The author we have just mentioned gives so clear and comprehensive an account of this dangerous business, which he saw performed, that we shall give part of it in his own words. "The diving stone hangs from an oar by a light country rope, and slip knot, and descends about five feet into the water. It is a stone of 56lb. weight, of the shape of a sugar loaf. The rope passes through a hole in the top of a stone, above which a strong loop is formed, resembling a stirrup-iron, to receive the foot of the diver," who is entirely naked, except a piece of *enhio* wrapped round his waist; swimming near the side of the vessel, he takes the rope in one hand, and places his foot in the stirrup on the stone; a basket is then thrown into the water to him, made of a hoop and net work below it, in which he places the other foot: after preparing his lungs for ceasing to breathe, he presses his nostrils firmly with one hand, and with the other pulls the rope forming the slip-knot; the stone carries him instantly to the bottom, where he no sooner arrives, than he disengages himself from the stirrup, which, with the stone, is immediately drawn up by the people in the boat. The diver throws himself forward upon his face, and grasps every thing in his way as rapidly as possible, and putting it into the basket, gives a signal when it is full by pulling the rope, when that also is hauled up; he then ascends by the rope, and frequently arrives at the surface before the basket: such is the consequence of custom, that though the diver cannot descend

again without an interval of rest, he seldom enters the boat, remaining swimming and floating about during the whole day.

Besides the other dangers peculiar to this pursuit, the divers are liable to be devoured by sharks: but whatever may be the cause, an accident seldom occurs, which these superstitious people attribute to the powerful aid of shark charmers, without whom, and the exercise of their diabolical incantations, they will on no account undertake their labours. The most experienced diver has never been known to remain longer than one minute and a half under water, in which time he may gather 150 oysters, if they are numerous; but he sometimes gains not more than from five to a dozen, accompanied by coral pieces of rock and other substances, for he has no time to separate and examine what he seizes. When 300 boats are employed in the fishery, it is supposed that at least 1500 divers are constantly descending, the noise of which resembles the incessant roaring of a cataract. The return of the fleet in regular order, at one or two P. M. and their arrival, with the crowds waiting to welcome their return, presents a very animating and gratifying spectacle.

The method adopted to extract the pearls is dreadfully disgusting and unwholesome, as they do not undertake this operation till the oysters have been deposited in heaps for ten days, or till the flesh has become decidedly putrid: the reason for so doing is obvious, as the particles of decayed matter and maggots are readily floated off by repeated washings in inclined receptacles, so contrived as to arrest the progress of even the smallest pearls, as they descend by their weight. Every possible precaution is taken, by picking and sifting, to secure the whole of the produce, and yet it is said that vast numbers are lost.

After the most valuable are selected, they are sent to be drilled; a most ingenious and delicate operation, which is thus performed: a piece of wood in the shape of an inverted cone is placed upon three legs, raising it about one foot from the ground: holes of various dimensions are made in the surface to receive the pearls: the person who drills sits close to the machine; he then drives the pearls steady into their sockets. "A well-tempered needle is fixed in a reed five inches long, with an iron point at the other end, formed to play in the socket of a cocoa nut shell, which presses on the forehead of the driller. A bow is formed of a piece of bamboo and a string. The workman brings his right knee in a line with the machine, and places on it a small cup, formed of part of a cocoa nut shell, which is filled with water to moderate the heat of friction. He bends his head over the machine, and applying the point of the needle to a pearl sunk in one of the pits, drills with great facility, every now and then dexterously dipping the little finger of his right hand in the water, and applying it to the middle, without impeding the operation. In this manner he bores a

pearl in the space of two or three minutes, and in the course of a day perforates 300 small, or 600 large pearls."

There are different methods of fishing for pearls practised in other parts of the world; but as the Ceylon fishery eclipses them all, and the simplicity of the invention is so obvious, it would be well if it were universally adopted.

PEARLSTEIN, or PEARLSTONE, in mineralogy, occurs in round and longish vesicles. Its lustre is shining and pearly, and its colour varies from the pearl to the flesh red and greyish black. It is composed of thin, concentric, lamellar concretions. It is translucent on the edges, easily frangible, and soft. It occurs in porphyry, and contains balls of obsidian, and is found in Hungary. It is composed of

Silex	75.25
Alumina	12.
Oxid of iron	1.6
Potash	4.5
Lime	2.5
Water	2.5

98.35

Loss 1.65

100

PEARLS (Artificial). Attempts have been made to take out stains from pearls, and to render the foul opaque-coloured ones equal in lustre to the oriental. Abundance of processes are given for this purpose in books of secrets and travels; but they are very far from answering what is expected from them. Pearls may be cleaned indeed from any external foulnesses by washing and rubbing them with a little Venice soap and warm water, or with ground rice and salt, with starch and powder-blue, plaster of Paris, coral, white vitriol and tartar, cuttle-bone, pumice-stone, and other similar substances; but a stain that reaches deep into the substance of pearls is impossible to be taken out. Nor can a number of small pearls be united into a mass similar to an entire natural one, as some pretend.

There are, however, methods of making artificial pearls in such manner as to be with difficulty distinguished from the best oriental. The ingredient used for this purpose was long kept a secret; but it is now discovered to be a fine silver-like substance found upon the under side of the scales of the blay or bleak fish. The scales, taken off in the usual manner, are washed and rubbed with fresh parcels of fair water, and the several liquors suffered to settle: the water being then poured off, the pearly matter remains at the bottom, of the consistence of oil, called by the French essence d'orient. A little of this is dropped into a hollow bead of blueish glass, and shaken about so as to line the internal surface; after which the cavity is filled up with wax, to give solidity and weight. Pearls made in this manner are distinguishable

from the natural only by their having fewer blemishes.

PEAR'LED. *a.* (from *pearl*.) Adorned or set with pearls (*Milton*).

PEAR'LEYED. *a.* (*pearl* and *eye*.) Having a speck in the eye.

PEARLWORT. See *SAGINA*.

PEARLY. *a.* (from *pearl*.) 1. Abounding with pearls; containing pearls (*Woodward*).

2. Resembling pearls (*Drayton*).

PEA'RMAIN. *s.* An apple (*Mortimer*).

PEARSON (John), a very learned English bishop in the 17th century, was born at Snoring in 1613. After his education at Eton and Cambridge, he entered into holy orders in 1639, and was the same year collated to the prebend of Netherhaven in the church of Sarum. In 1640 he was appointed chaplain to the lord keeper Finch, and by him presented to the living of Torrington in Suffolk. In 1650 he was made minister of St. Clement's, East-cheap, in London. In 1657, he and Mr. Gunning had a dispute with two Roman Catholics upon the subject of schism; a very unfair account of which was printed at Paris in 1658. Some time after, he published at London an Exposition of the Creed, in folio, dedicated to his parishioners of St. Clement's, East-cheap, to whom the substance of that excellent work had been preached several years before, and by whom he had been desired to make it public. The same year he likewise published *The Golden Remains of the ever memorable Mr. John Hales of Eton*; to which he prefixed a preface, containing, of that great man, with whom he had been acquainted for many years, a character drawn with great elegance and force. Soon after the Restoration, he was presented by Juxon, then bishop of London, to the rectory of St. Christopher's in that city; created doctor of divinity at Cambridge, in pursuance of the king's letters mandatory; installed prebendary of Ely; archdeacon of Sarum; and made master of Jesus college in Cambridge: all before the end of the year 1660. March 25th, 1661, he was appointed Margaret professor of divinity in that university; and, the first day of the ensuing year, was nominated one of the commissioners for the review of the liturgy in the conference at the Savoy. April 14th, 1662, he was admitted master of Trinity college in Cambridge; and, in August, resigned his rectory of St. Christopher's and prebend of Sarum. In 1667 he was admitted a fellow of the Royal Society. In 1672 he published at Cambridge, in 4to, *Vindiciæ Epistolæ S. Ignatii*, in answer to Mons. Dailé; to which is subjoined, *Isaaci Vossii epistolæ duæ adversus Davidem Blondellum*. Upon the death of the celebrated Wilkins, Pearson was appointed his successor in the see of Chester, to which he was consecrated February 9th, 1672-3. In 1682, his *Annales Cyprianici, sive tredecim annorum, quibus S. Cyprian, inter Christianos versatus est, historia chronologica*, was published at Oxford, with Fell's edition of that father's works. Pearson was disabled from all

public service by ill health a considerable time before his death, which happened at Chester, July 16th, 1686.

PEAR-TREE, the tree that bears pears. See PYRUS.

PEASANT, a hind; one whose business is rural labour. It is amongst this order of men that a philosopher would look for innocent and ingenuous manners. The situation of the peasantry is such as secludes them from the devastations of luxury and licentiousness; for, when the contagion has once reached the recesses of rural retirement, and corrupted the minds of habitual innocence, that nation has reached the summit of vice, and is hastening to that decay which has always been the effect of vicious indulgence. The peasantry of this country till lately retained that simplicity of manners and rustic innocence which ought to be the characteristic of this order of society; and, in many parts, their condition is still such as, were all its advantages sufficiently known, would create envy in the minds of those who have toiled through life, amidst the bustle of the world, in quest of that happiness which it could not confer.

*O fortunatos nimium, sua si bona norint,
Agricolae.* — VIRGIL.

In other countries the peasants do not enjoy the same liberty as they do in our own, and are consequently not so happy. In all feudal governments they are abject slaves, entirely at the disposal of some petty despot. Much of the happiness and of the real prosperity of a country depend upon the state of the peasantry.

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates, and men decay:
Princes and lords may flourish, or may fade;
A breath can make them as a breath has made;
But a bold peasantry, their country's pride,
When once destroy'd, can never be supplied."

GOLDSMITH.

PEASANTRY. *s.* Peasants; rustics; country people (*Locke*).

PEASCOD. **PEASHELL**. *s.* (*pea, cod* and *shell*). The husk that contains peas (*Gay*).

PEASE. *s.* Food of peas (*Arbutnot*).

PEAT, in mineralogy, a combustible material often called turf, consisting of a congeries of vegetable matter, in which the remains of organization are more or less visible; comprising trunks of trees, chiefly oak, fir, birch, alder, hazle, and willow; of leaves and fruits, particularly hazle-nuts; and of long stringy fibres which appear for the most part the remains of the sphagnum palustre, and other aquatic mosses. It occurs, for the most part, in extensive beds called peat-mosses, either occupying the surface of the soil, or covered to the depth of a few feet with sand, gravel and other alluvial matters. It is met with abundantly in the northern and in some of the central districts of Europe, in all moist uncultivated mountainous tracts, as high as vegetation extends; it is also frequent in low vallies and fenny plains; and in several parts of the western shore of Great Britain runs into the sea, to an

unknown extent, as in the harbour of Oban in Argyleshire; in Lancashire, a little town to the north of Liverpool; and near Towyn in Merionethshire.

The depth of peat-mosses is very various; from a few feet to twelve or fifteen yards or even more. The consistence of peat is equally various, being sometimes in a semifluid state, forming a black impassable wilderness, studded here and there by tufts of rushes. When more solid it is scantily covered over with heath and coarse grasses, and is then passable by sheep and other larger animals, especially during the dry season of the year. In all deep peat-mosses it is found that the upper part of the peat is looser, of a lighter colour, and less inflammable than that which forms the lower part of the bed. When of a good quality it is moderately compact, and may readily be cut into solid masses like bricks with a sharp thin spade. If it manifests any considerable degree of elasticity and resistance to the spade, its quality is always found to be very inferior. By exposure to the air it dries slowly, being very retentive of moisture, acquires a brownish black colour, becomes moderately hard, and in this state is very inflammable. By the further action of the weather it falls gradually to pieces, and is decomposed though very slowly. When kindled in an open grate the best kind burns with a yellowish-blue flame almost like charcoal, and a less quantity of smoke than wood affords: it gives out a great quantity of heat, and is reduced to light ashes of a white or reddish-yellow colour. Some varieties of peat are considerably charged with iron pyrites, on which account they effloresce and vitriolize when exposed to the air, and in burning give out a strong sulphureous odour, much smoke and little heat, and afford a heavy reddish-brown ash. Sulphats of soda and magnesia are also occasionally found in peat, and produce a similar bad effect on it, considered as a combustible.

By digestion in boiling water peat affords a deep brown solution, slightly bitter to the taste, and containing an uncombined vegetable acid considerably resembling the suberic, with a portion of extract, and a little sulphat.

By dry distillation there comes over a watry ammoniacal liquor, an empyreumatic oil, and carburetted hydrogen, a considerable quantity of charcoal remaining in the retort.

Many ingenious attempts have been made, especially in France and Germany, to substitute with economy the charcoal of peat for that of wood, for culinary and metallurgical purposes, and it seems to be satisfactorily proved that a given bulk of the former burns somewhat longer, and affords a more considerable heat than of the latter; but it appears to be incapable of withstanding the action of a forge bellows, and is apt to deteriorate the quality of iron that is smelted by it. Another objection however occurs to the employment of peat charcoal on the score of its being less economical, except in very particular circumstances, than wood charcoal. It cannot be prepared in

the manner of common charcoal, on account of its loose texture, without a prodigious loss of the substance and deterioration of quality: the manufacturer must therefore have recourse to distillation in iron cylinders, or other vessels; but to effect this so large a quantity of peat must be consumed as fuel, that the value of the charcoal, the oil and ammonia will hardly cover the expence. Hence it is that all the establishments in France for this purpose have of late been entirely abandoned. See the article *TURFA*.

PEAT. s. (from *petit*, Fr.) A little fondling; a darling: now commonly *pet* (*Donne*).

PEAUCIER, in anatomy, a name given by Winslow, in his Treatise on the Head, and by some of the French writers, to the muscle called by Albinus *latissimus colli*; and by others *dehrens quadratus*, and *quadratus genæ*. Santorini has called the part of this which arises from the cheek *musculus risorius novus*; and some call the whole *platysma myoides*.

PEBBLES, the name of a genus of fossils, distinguished from the flints and homocroa by their having a variety of colours. These are defined to be stones composed of a crystalline matter debased by earths of various kinds in the same species, and then subject to veins, clouds, and other variegations, usually formed by incrustation round a central nucleus, but sometimes the effect of a simple crystallization; and veined like the agates, by the disposition which the motion of the fluid they were formed in gave their differently coloured substances.

The variety of pebbles is so great, that an hasty describer would be apt to make almost as many species as he saw specimens. A careful examination will teach us, however, to distinguish them into a certain number of essentially different species, to which all the rest may be referred as accidental varieties. When we find the same colours, or those resulting from a mixture of the same, such as nature frequently makes in a number of stones, we shall easily be able to determine that these are all of them the same species, though of different appearances; and that whether the matter be disposed of in one or two, or in 20 crusts, laid regularly round a nucleus; or thrown irregularly, without a nucleus, into irregular lines; or, lastly, if blended into an uniform mass.

See *PYROMACHUS* and *PETROSILEX*.

PEBBLED. a. (from *pebble*.) Sprinkled or abounding with pebbles (*Thomson*).

PEBBLY. a. (from *pebble*.) Full of pebbles.

PECARI, in mastiology. See *Sus*.

PECCABILITY. s. (from *peccable*.) State of being subject to sin (*Decay of Piety*).

PECCABLE. a. (from *pecco*, Lat.) Liable to sin.

PECCADILLO. s. (Spanish; *peccadille*, Fr.) A petty fault; a slight crime; a venial offence (*Atterbury*).

PECCANCY. s. (from *peccant*.) Bad quality (*Wiseman*).

PECCANT. a. (*peccant*, Fr.) 1. Guilty; criminal (*South*). 2. Ill-disposed; corrupt;

bad; offensive to the body; injurious to health (*Arbutnot*). 3. Wrong; bad; deficient; informal (*Ayliffe*).

PECHBLENDE, in mineralogy, a species of *URANIUM*, which see.

PECHLARN, a town of Austria, on the right bank of the Danube. The river is very wide; and here the Romans, who called it *Præclara*, had a harbour for their navy. It is 14 miles W. of St. Polten, and 48 E. of Linz.

PECHURIM CORTEX. An highly aromatic bark, the produce of a species of *laurus*. It is extremely fragrant, like that of cinnamon, which it greatly resembles in its properties. In Lisbon it is much esteemed in the cure of dysenteries, and for allaying obstinate vomitings.

PECHURIM FABA. See *FABA PECHURIM*.

PECHURIS. See *PECHURIM*.

PECHYS, a name used by some anatomical writers for the elbow.

PECK (Francis), an antiquary, born 1692, at Stamford, Lincolnshire. He was educated at Cambridge, and obtained the living of Godeby, near Melton, Leicestershire, where he died 1743. He published 1727, in folio, *The Antiquarian Annals of Stamford, &c.*—*Memoirs of Cromwell and of Milton*, 2 vols. 4to. He published besides *Desiderata Curiosa*, 2 vols. containing curious pieces of English history, &c.

PECK. s. (from *poea*, Saxon.) 1. The fourth part of a bushel (*Hudibras*). 2. Proverbially. (In low language.) A great deal (*Suckling*).

To PECK. v. a. (*becquer*, Fr. *picken*, Dut.) 1. To strike with the beak as a bird. 2. To pick up food with the beak (*Addison*). 3. To strike with any pointed instrument (*Carew*). 4. To strike; to give blows (*South*).

PECKER. s. (from *peck*.) 1. One that pecks. 2. A kind of bird: as the wood-pecker (*Dryden*).

PECKLED. a. (corrupted from *speckled*.) Spotted; varied with spots (*Walton*).

PECKWELL (Henry), a divine of the church of England, and rector of Bloxham, in Lincolnshire. He was born in 1747, and attached himself to the Calvinistic methodists, among whom he was very popular. Dr. Peckwell was the principal founder of a society for visiting the sick at their own homes; and, to make himself the more useful, he studied physic. In opening a young person who died of a putrid fever, he unfortunately wounded himself in the hand, which mortified, and ended in his death in 1787. He printed some sermons preached on particular occasions.

PECORA. In the general system of Linneus, the fifth order in the class mammalia, thus ordinarily characterized: without fore-teeth in the upper jaw, many in the lower; feet hoofed, cloven; food, herbs which they pluck; they chew the cud; have four stomachs, the paunch to macerate and ruminate the food, the bonnet, reticulate, to receive it, the omasus or manipples of numerous folds to digest it, and

the abomasus or caille, fasciate, to give it ascescency and prevent putrefaction. See ZOOLOGY.

PECQUET (John), a celebrated physician, born at Dieppe. He immortalized his name by the discovery of the lacteal vein which conveys the chyle to the heart, and from him termed the reservoir of Pecquet. In 1654, he published, at Paris, a work entitled *Experimenta nova Anatomica*, and in 1661, at Amsterdam, *De Thoracis Lacteis*, which added greatly to his reputation. He died at Paris in 1674.

PECQUET (Antoine), a celebrated French scholar, born in 1704. His writings, which are numerous, shew at once the philosopher, the politician, and the moralist. His *Spirit of the Laws*, and of *Political Maxims*, and *Thoughts on Man*, are the most esteemed. He was made grand-master of the water-works and forests of Rouen, and died in 1762. (*Watkins*).

PECQUET'S DUCT. See **THORACIC DUCT**.

PECTEN. See **OSTREA**.

PECTINÆUS, in myology. See **PECTINALIS**.

PECTINALIS. (*pectinalis musculus*, so named from its arising at the *pecten*, or pubis.) *Pectinæus* of Albinus. In myology. This is a small flat muscle, situated obliquely between the pubis and the little trochanter, at the upper and anterior part of the thigh. It arises broad and fleshy from all the anterior edge of the os pectinis, or pubis, as it is more commonly called, as far as its spine, and descending obliquely backwards and outwards, is inserted by a short and broad tendon, into the upper and anterior part of the *linea aspera* of the os femoris a little below the lesser trochanter. This muscle serves to bend the thigh, by drawing it upwards and inwards, and likewise assists in rolling it outwards.

PECTINATE LEAF. A sort of pinnate leaf, in which the leaflets are toothed like a comb: as in *artemisia pectinata*. The term is also used in the same sense in zoology.

PECTINATI MUSCULI. (*Pectinatus*, from *pecten*, a comb; so named from their supposed resemblance.) The fasciculated muscular fibres of the right auricle of the heart.

PECTINATION. *s.* The state of being pectinate.

PECTIS, in botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; seeds crowned with three or four awns; calyx five-leaved; florets of the ray five. Five species, natives of the West Indies.

PECTORAL, a sacerdotal habit or vestment, worn by the Jewish high-priest. The Jews called it *hoshchen*, the Greeks *κορυμβιον*, the Latins *rationale* and *pectorale*, and in our version of the Bible it is called *breastplate*. It consisted of embroidered stuff, about a span square, and was worn upon the breast, set with twelve precious stones, ranged in four rows, and containing the names of the twelve tribes. It was fastened to the shoulder by two chains

and hooks of gold. God himself prescribed the form of it. See **BREASTPLATE**.

PECTORALIS. In anatomy. See **PECTORALIS MAJOR**.

PECTORALIS MAJOR. (*masculus pectoralis*; from *pectus*, the breast.) *Pectoralis* of Albinus. This is a broad, thick, fleshy, and radiated muscle, situated immediately under the integuments, and covering almost the whole anterior part of the breast. Winslow calls it *pectoralis major*, to distinguish it from the *serratus anticus*, which he has named *pectoralis minor*. It arises from the cartilaginous extremities of the fifth and sixth ribs, from the last of which its tendinous fibres descend over the upper part of the obliquus externus and rectus abdominis, helping to form a part of the sheath in which the latter is included. It likewise springs from almost the whole length of the sternum by short tendinous fibres, which evidently decussate those on the other side; and tendinous and fleshy from more than a third of the anterior part of the clavicle. From these origins the fibres run in a folding manner towards the axilla, and are inserted by a broad tendon into the os humeri, above the insertion of the deltoid muscle, and at the outer side of the groove which lodges the tendon of the long head of the biceps: some of its fibres likewise extend into that groove; and, from the lower part of this tendon, which is spread near two inches along the os humeri, we find it sending off other fibres, which help to form the fascia that covers the muscles of the arm. It often happens, that that part of the *pectoralis* which arises from the clavicle is separated from the inferior portion, so as to appear like a distinct muscle. This has induced Winslow to divide it into parts, one of which he calls the *clavicular*, and the other the *thoracic portion*. Sometimes these two portions are inserted by separate tendons, which cross one another at the upper and inner part of the os humeri, the tendon of the thoracic portion being inserted at the outer edge of the bicipital groove, immediately behind the other. This muscle, and the *latissimus dorsi*, form the cavity of the axilla or arm-pit. The use of the *pectoralis* is to move the arm forwards, or to raise it obliquely towards the sternum. It likewise occasionally assists in moving the trunk upon the arm; thus, when we exert any efforts with the hand, as in raising ourselves from off an arm-chair, or in sealing a letter, the contraction of this muscle is particularly observable. To these uses Haller adds that of assisting in respiration, by raising the sternum and ribs. He tells us he well remembers, that when this muscle was affected by rheumatism, his breathing was incommoded: and that, when troubled with difficulty of respiration, he has often found himself greatly relieved by raising and drawing back his shoulders, keeping his arms at the same time firmly fixed. Winslow, however, has denied this use, and Albinus has omitted it, probably because it does not take place in a natural state.

PECTORALIS MINOR. *Serratus anticus* of K 2

Albinus. Douglas calls this muscle serratus minor anticus, and Winslow gives it the name of pectoralis minor. It is a fleshy and pretty considerable muscle, situated at the anterior and lateral part of the thorax, immediately under the pectoralis major. It arises from the upper edges of the third, fourth, and fifth ribs, near where they join with their cartilages by an equal number of tendinous and fleshy digitations, which have been compared to the teeth of a saw, whence this and some other muscles, from their having a similar origin or insertion, have gotten the name of serrati. From these origins it becomes thicker and narrower as it ascends, and is inserted by a flat tendon into the upper part of the coracoid process of the scapula. The principal use of this muscle is to draw the scapula forwards and downwards; and when that is fixed, it may likewise serve to elevate the ribs.

PECTORALS. (*medicamenta pectoralia*, from *pectus*, the breast,) Medicines that relieve disorders of the chest.

PECTUS. The breast. See **THORAX**.

PECULATE. **PECULATION.** *s.* (*peculatus*, Lat. *peculat*, Fr.) Robbery of the public; theft of public money.

PECULATOR. *s.* (Latin.) Robber of the public.

PECULIAR. *a.* (*peculiaris*, Lat.) 1. Appropriate; belonging to any one with exclusion of others (*Swift*). 2. Not common to other things (*Locke*). 3 Particular; single (*Milton*).

PECULIAR. *s.* 1. The property; the exclusive property (*Milton*). 2. Something absconded from the ordinary jurisdiction (*Carew*).

PECULIAR, in the canon law, signifies a particular parish or church that has jurisdiction within itself for granting probates of wills and administrations, exempt from the ordinary or bishop's court. The king's chapel is a royal peculiar, exempt from all spiritual jurisdiction, and reserved to the visitation and immediate government of the king himself. There is likewise the archbishop's peculiar: for it is an ancient privilege of the see of Canterbury, that wherever any manors or advowsons belong to it, they forthwith become exempt from the ordinary, and are reputed peculiars: there are 57 such peculiars in the see of Canterbury. Besides these, there are some peculiars belonging to deans, chapters, and prebendaries, which are only exempted from the jurisdiction of the archdeacon: these are derived from the bishop, who may visit them, and to whom there lies an appeal.

PECULIARS (Court of), is a branch of, and annexed to, the court of Arches. It has a jurisdiction over all those parishes dispersed through the province of Canterbury in the midst of other dioceses, which are exempt from the ordinary's jurisdiction, and subject to the metropolitan only. All ecclesiastical causes arising within these peculiar or exempt jurisdictions are originally cognizable by this court; from which an appeal lay formerly to the pope, but now, by the stat. 25 Henry VIII. c. 19. to the king in chancery.

PECULIARITY. *s.* (from *peculiar*.) Particularity; something found only in one (*Swift*).

PECULIARLY. *ad.* (from *peculiar*.) 1. Particularly; singly (*Woodward*). 2. In a manner not common to others (*Fell*).

PECUNIARY. *a.* (*pecuniarius*, Lat.) 1. Relating to money (*Brown*). 2. Consisting of money (*Bacon*).

PED. *s.* (commonly pronounced *pad*). 1. A small packsaddle (*Tusser*). 2. A basket; a hamper (*Spenser*).

PEDAGOGICAL. *a.* (from *pedagogue*.) Suited or belonging to a schoolmaster.

PEDAGOGUE. *s.* (*παιδαγωγος*.) One who teaches boys; a schoolmaster; a pedant (*Dryden*).

To PEDAGOGUE. *v. a.* (*παιδαγωγῶ*.) To teach with superciliousness (*Prior*).

PEDAGOGY. *s.* (*παιδαγωγία*.) Preparatory discipline (*South*).

PEDAL. *a.* (*pedalis*, Lat.) Belonging to a foot.

PEDALE. (Ital.) In music. An epithet applied to a fixed or stationary bass, during which the superior parts evolve through various independent harmonies.

PEDAL-NOTE. A holding note, during which the harmony formed by the other parts of the composition is allowed to proceed independently.

PEDALS, the largest pipes of an organ, so called because played and stopped with the foot. The pedals are made square, and of wood; they are usually 13 in number. They are of modern invention, and serve to carry the sounds an octave deeper than the rest. See **ORGAN**.

PEDALIUM, in botany, a genus of the class didynamia, order angiospermia. Calyx five-parted; corol somewhat ringent, with the border five-cleft; nut corky, four-sided, with spinous angles, two-celled; seeds two. One species; a native of India, with stem simple, and axillary, solitary flowers.

PEDANEUS. *a.* (*pedaneus*, Lat.) Going on foot.

PEDANT. *s.* (*pedant*, Fr.) 1. A schoolmaster (*Dryden*). 2. A man vain of low knowledge (*Swift*).

PEDANTICAL. **PEDA'NTIC.** *a.* (*pedantesque*, Fr. from *pedant*.) Awkwardly ostentatious of learning (*Hayward*).

PEDANTICALLY. *ad.* With awkward ostentation of literature (*Dryden*).

PEDANTRY. *s.* (*pedanterie*, Fr.) Awkward ostentation of needless learning (*Cowley*).

PEDATE, in zoology, deeply cut into segments connected with the petiole on the inner side only, like a bird's foot.

PEDATE LEAF. (*pes*, a foot). In botany. Cum petiolus bifidus latere tantum interiore adnecit foliola plura. When a bifid petiole connects several leaflets on the inside only. This is a species of compound leaf, and bears some resemblance to a bird's foot. It is exemplified in *passiflora*, *arum*, and *helleborus foetidus*. It is applied also to the raceme.

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PEDATIFID LEAF. In botany. This is to pedate, what pinnatifid is to pinnate: the parts of the leaf not being separate; but connected, as in the feet of water fowl. Exemplified in *arum muscivorum*.

To PEDDLE. *v. n.* To be busy about trifles: commonly written *piddle* (*Ainsworth*).

PEDDLING. *a.* Petty-dealing; trifling; unimportant (*Decay of Piety*).

PEDEE, a river of the United States which rises in N. Carolina, and is there called Yadkin river; on entering S. Carolina, it takes the name of Pedee, and flows into Winyaw bay, at Georgetown.

PEDERASTS, the same with Sodomites.

PEDERERO. *s.* (*pedrero*, Span.) A small cannon managed by a swivel. It is frequently written *paterero*.

PEDES HIPPOCAMPI. (*pes*, *pedes*). In anatomy, two columns at the end of the fornix of the brain, which diverge posteriorly. They are so named from their resemblance to the feet of the hippocampus, or sea-horse.

PEDESTAL. *s.* (*pedestal*, Fr.) The lower member of a pillar; the basis of a statue (*Add*).

PEDESTRIOUS. *a.* (*pedestris*, Lat.) Not winged; going on foot (*Brown*).

PEDIÆAN, in Grecian antiquity. The city of Athens was anciently divided into three different parts; one on the descent of an hill; another on the sea-shore; and a third in a plain between the other two. The inhabitants of the middle region were called *παιδαί*, *Pediæans*, formed from *παιδιον*, plain, or flat; or, as Aristotle will have it, *Pediaci*: those of the hill, *Diacrians*; and those of the shore, *Paraliens*. These quarters usually composed so many different factions. Pisistratus made use of the *Pediæans* against the *Diacrians*. In the time of Solon, when a form of government was to be chosen, the *Diacrians* chose it democratic; the *Pediæans* demanded an aristocracy; and the *Paraliens* a mixed government.

PEDICEL, or **PEDICLE**, in botany. In Philos. Botan. it is interpreted—*pedunculus partialis*, a partial peduncle. But in Delin. Pl. a partial peduncle is a subdivision of a common peduncle, supporting a few flowers. The genuine notion of a pedicel is, that it supports one flower only where there are several on a peduncle; or, it is the ultimate subdivision of a common peduncle, immediately connected with the flower itself.

PEDICELLARIA, in zoology, a genus of the class vermes, order molusca. Body soft and seated on a rigid fixed peduncle; aperture single. Three species; all inhabitants of the North Seas, and found in the midst of the spines of echini. *P. globifera* has a spherical head, but no neck; its body is minute and resembles a mucor; the colour of the head is reddish, and has the appearance of a small cherry; peduncle or stem tawny and covered with a gelatinous hyaline skin.

PEDICULAR. *a.* (*pedicularis*, Lat.) Having the phthyriasis or lousy distemper (*Ainsworth*).

PEDICULARIA. (*pedicularia*, from *pedi-*

P E D

culus, a louse; so called from its use in destroying lice.) The herb staves acre. See **STAPHISAGRIA**.

PEDICULARIS. Louse-wort. In botany, a genus of the class didynamia, order angiospermia. Calyx mostly five-cleft, inflated; corol with the upper lip compressed and emarginate; capsule two-celled, mucronate, oblique; seeds few, angular, mucronate. Thirty-four species. Almost all European plants; two common to the marshes or pastures of our own country.

PEDICULUS. Louse. In zoology, a genus of the class insecta, order aptera. Mouth with a retractile, recurved sucker without proboscis; tentacleless; antennae as long as the thorax; eyes two; abdomen depressed; legs six, formed for running. Sixty-six species; about half of them common to our own country, and found on the bodies of man, quadrupeds, birds, and the larger insects. They live by extracting animal juices: the larvae and pupae are six-footed and nimble, resembling the insect in its perfect state. It is highly probable, though not more than sixty-six species have yet been classified, that there is no tribe of quadrupeds or birds that is not infested by a pediculus of its own. Their specific names are derived from the animal they inhabit: hence we have *P. humanus*, *P. suis*, *P. ovis*, *P. anseris*, &c. Man appears to be infested by three distinct species:

1. *P. humanus*. Common louse, with lobed cinereous abdomen, found in the heads and on the garments of such as are naturally uncleanly, especially boys.

2. *P. pubis*. Crab-louse, with chaliciform legs, and the abdomen emarginate behind: found on the groins and eye-brows of uncleanly men.

3. *P. ricinoides*: with reddish body, abdomen orbicular with a white line; scutell three-lobed; and white sucker armed with small hooks beneath. Inhabits America, and gets into the legs of the naked inhabitants, where it draws blood; and depositing its eggs in the wound, occasions foul and malignant ulcers.

Lewenhoeek affirms, that the first of these is, in the male sex, furnished with a sting at the extremity of the abdomen, and that hence proceeds the irritation the animal inflicts. The male is easily distinguished from the female, the tail or tip of the abdomen being rounded in the former, and forked or bifid in the latter. He found that in six days a female will lay fifty eggs; and upon dissecting it after that period, he discovered as many more in the ovary, whence he concluded that in twelve days it would have laid a hundred eggs; these eggs hatching in six days, which he found to be their natural time, would probably produce fifty males and as many females; and these females, attaining their full growth in eighteen days, might each of them be supposed, after twelve days more, to lay also a hundred eggs; which in six days further (the time required to hatch them), might produce a

younger brood of five thousand; so that in eight weeks a single insect might see five thousand of its own descendants.

The phthiriasis, or disease of lice, spoken of by Pliny and other ancient writers, referred to in the sacred scriptures, and treated of by medical writers in modern times, does not appear to be produced by insects of this tribe.

PEDIGREE. *s.* (*per* and *dégré*, *Skinner.*) Genealogy; lineage; account of descent.

PEDILUVIUM. (from *pedes*, the feet; and *lavo*, to wash.) A bath for the feet.

PEDIMENT, in architecture, a kind of low pinnacle; serving to crown porticos, or finish a frontispiece; and placed as an ornament over gates, doors, windows, niches, altars, &c.

The pinnacles of the ancient houses, Vitruvius observes, gave architects the first idea of this noble part; which still retains the appearance of its original.

The parts of the pediment are, the tympanum and its cornice. See **ARCHITECTURE**.

PEDLAR, or **PE'DLER.** *s.* (a contraction from *petty-dealer.*) One who travels the country with small commodities (*Shakspeare*).

PEDLERY. *s.* (from *pedler.*) Wares sold by pedlars (*Swift*).

PEDOBAPTISM. *s.* (*παιδος* and *βαπτισμ.*) Infant baptism.

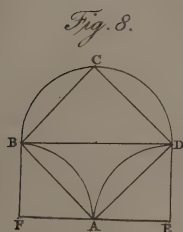
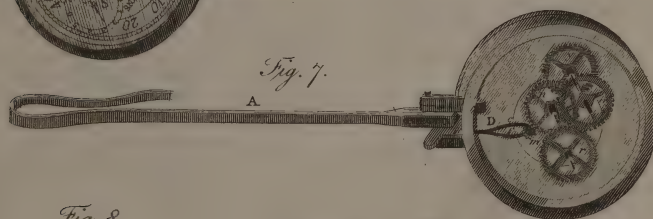
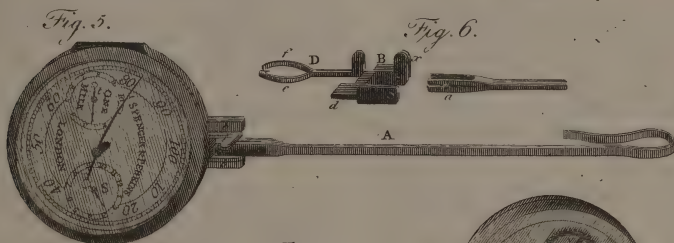
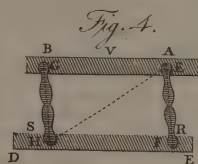
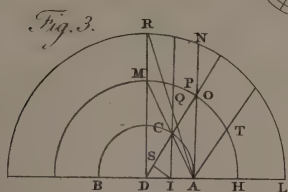
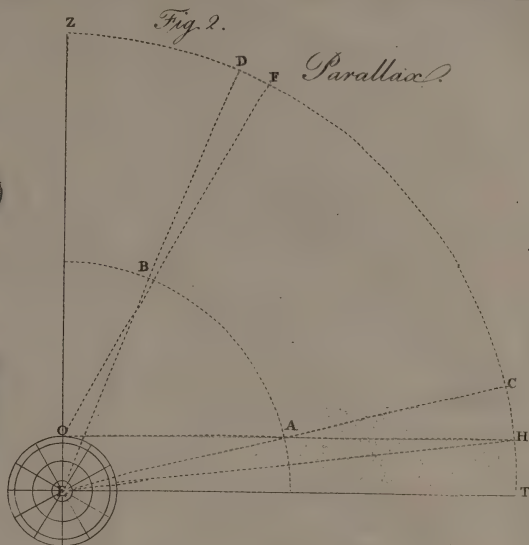
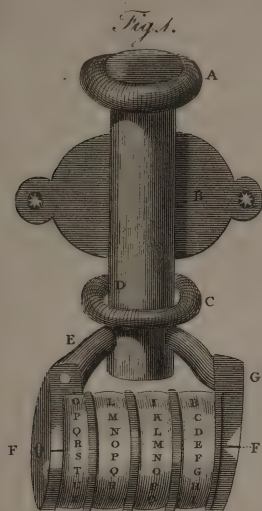
PEDOBAPTIST. *s.* (*παιδος* and *βαπτιστης.*) One that holds or practises infant baptism.

PEDOMETER, or **PODOMETER**, formed from *πες*, *pes*, foot; and *μετρον*, measure, way-wiser; a mechanical instrument, in form of a watch, consisting of various wheels with teeth, catching in one another, all disposed in the same plane; which, by means of a chain or string fastened to a man's foot, or to the wheel of a chariot, advance a notch each step, or each revolution of the wheel; so that the number being marked on the edge of each wheel, one may number the paces, or measure exactly the distance from one place to another. There are some of them which mark the time on a dial-plate, and are in every respect much like a watch, and are accordingly worn in the pocket like a watch.

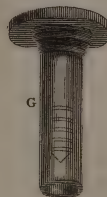
Figs. 5, 6, and 7, plate 129, serve to illustrate the mechanism and principle of one of Spencer and Perkins's ingenious pedometers, which when worked in the pocket ascertains the number of steps made by the wearer. The external appearance, fig. 5, is somewhat like that of a watch: in the place of the watch-chain is a brass lever *A*, figs. 5 and 7, one end of which is bent into a hook; the other has a hole *a* through it, as shown in fig. 6, and has a cleft cut in it through the hole; through this hole a wire passes, which wire is fixed between the two studs *b b*, figs. 5 and 7, so as to turn round freely; it also goes through the two arms of the piece *B*, fig. 6, and is made fast to them so that they turn with it the arm *x*, which is higher than the other, and has a narrow opening cut in it, into which is jointed a piece of steel *D* by a pin through its top; the end of the lever *A* has two small screws in it so as to

close up the hole *a*, and pinch the wire which passes through the hole tight. When the lever *A* is moved backwards and forwards, it turns the wire by friction, and moves the piece *B* up or down till it is stopped by its leaf *d* coming either against the under side of the dial, or against the back of the case, as shown in fig. 7; the lever then slips round the pin. When the piece *B* is moved up or down, it pushes or pulls the piece *D* in or out of the case: the end of this is in two branches *e f*; the latter ends in the plain point, the other is bent into a hook; these branches take on each side of a small ratchet wheel, in fig. 7; which has 10 teeth. When the lever *A* is moved so as to draw back the piece *D*, the hook *e* takes one of the teeth of the ratchet wheel *n*, and moves it round one tooth: at the same time the point *f* slips over the sloping side the opposite tooth, and when the piece *D* is pushed in, it also moves the wheel round one tooth in the same direction as while the hoof *e* slips over the teeth ready for the next movement. The ratchet *m* has a pinion of six teeth on its under side, which tacks into a wheel *n* of 60 teeth; on the spindle of this wheel (which projects through the dial) is fastened the long hand *i*, fig. 5. As the wheel *m* makes one revolution for ten strokes of the lever *A*, and its pinion has one-tenth of the number of teeth in the wheel *n*, it is evident that 100 strokes of the lever will be required for one revolution of the wheel *n*, and hand *i*. The wheel *n* has a pinion of six leaves on it, which gives motion to a wheel *o* of 60 teeth, which turns *r* of 60 teeth, on whose about the hand *t*, fig. 5, is fastened: the wheel *o* has a pinion of six leaves on the under side of it, which moves a wheel *y* of 72 teeth, which carries the hand *s*, fig. 1; by this arrangement the hand *t* will turn once round for 1000 strokes of the lever *A*; its dial is divided into 10 each, answering to 100, or 1 revolution of the hand *t*. The index *s* will turn round once for 1200 strokes of the lever; and its circle is divided into 12 parts, each of which denotes one revolution of the hand *t*, or 100 strokes of the lever; the hands are not fastened to their spindle, but can be turned round to set them all to *O* when it is going to be used. The best method of placing the machine, is with a case upon the thigh, the lever *A* brought towards the button of the waistband, and if possible, the joints of the lever over the joints of the thigh; so that the lever being over the belly, is at rest, while the motion of the thigh moves the case part of the machine at every step. Set all the hands to *O*; and when 100 paces are walked, the long hand will have made one revolution, and the hand will move to the figure 1, and so on as before described. Persons of middle stature are found to make about 1000 paces in a mile; but it is best to walk a mile several times, observing each time by the machine, the number of paces each time, and the average of these will serve to calculate by.

PEDRAZA, a town of Spain, in Old Castile, with a castle. It is the birth-place of the



Fountain Pen?



Multon, & Puffell Co.

P E D

emperor Trajan, and stands on the Cega, near its source, 25 miles N.E. of Segovia.

PEDRO POINT, the most northern point of the island of Ceylon, opposite Point Calymere, on the continent of Hindustan. Lon. 80. 27 E. Lat. 9. 52 N.

PEDRO (St.), one of the islands in the Pacific ocean, called Marquesas. Lon. 138. 51 W. Lat. 9. 58 S.

PEDUNCLE. (from *pedo*, *pedare*, the same with *fulcire*, or prop or support, and not as Dr. Berkenhout derives it from the noun *pedo*, splay-footed.) A peduncle. By older writers called the foot-stalk; by several moderns the fruit-stalk. To the first of these we object, because we have then the same term for the support of the fructification and of the leaf: to the second, because the peduncle being the support of the flowers as well as the fruit, we are reduced to the absurdity of saying a many-flowered fruit-stalk. To both we object, because peduncle is generally received, and is intelligible in every nation where botany is studied.

The peduncle is the fulcrum of the fructification, or a partial stem supporting that only. The explanation in Philos. Bot. is thus expressed: *truncus partialis elevans fructificationem, nec folia*. In Delin. Pl. thus: *fulcrum sustinens fructificationem*. In Regn. Veget. it is said to be *ramus caulis floriferus*; a flower-bearing branch from the stem. The last is the least accurate of the three, and wants the exclusion of the leaves as in the first.

Ray and other old writers use the classical term *pediculus*. Linnæus probably changed it for *pedunculus*, because the former signified a sort of insect, as well as the little stalk that supports a fruit.

With respect to its place, a peduncle may be,

1. Radical, or proceeding immediately from the root: as in the primrose.
2. Cauline, or proceeding from the stem.
3. Ramous, or proceeding from a branch. These may be called in English, a root-peduncle; a stem-peduncle; a branch-peduncle.
4. Petiolar, or proceeding from the petiole.
5. Cirriferous, or tendril-bearing.
6. Terminal, or proceeding from the top of the stem.
7. Axillary, or proceeding from the angle made by the leaf and stem, or the branch and stem.

8. Opposite-leaved.

9. Lateral flowered, or having the flower on the side of it.

10. Interfoliaceous, or rather among the leaves. I rather think that this is a mistake for, perhaps, intrafoliaceous, within the leaf.

11. Extrafoliaceous. Without, or on the outside of the leaf.

12. Suprafoliaceous. Inserted into the stem higher than the leaf or its petiole.

With respect to its direction, a peduncle may be,

1. Pressed close to the stem.
2. Upright.

P E E

3. Spreading.

4. Drooping. Pointing to the ground.

5. Upside down.

6. Bowed or curved downwards.

7. Nodding. Curved downwards more than in n. 6. but less than in n. 4.

8. Rising gradually.

9. Weak, so as to bend with the weight of the flower.

10. Pendulous or loose, so as to tend downwards with the leaf.

11. Stiff and straight.

12. Flexuous, or bending this way and that.

13. Bent backwards as if broken.

With respect to their situation, peduncles may be,

1. Opposite to each other; or, 2. Alternate.

3. Scattered; without any regular order.

4. Verticillate, or in whorls.

With respect to their number, they may be,

1. Solitary or single.

2. Double; two together, or in pairs.

In an umbellule there are several equal peduncles diverging from the same point or centre.

According to the number of flowers which a peduncle bears, it is called uniflorous, biflorous, triflorous, &c. and multiflorous. One, two, three-flowered, and many-flowered.

With respect to its measure, a peduncle is,

1. Short, very short.

2. Long, very long.

With respect to its structure, a peduncle is,

1. Round, cylindric, or rather columnar.

2. Triquetrate. Three-sided.

3. Tetragonous. Four-cornered.

4. Filiform. Like a thread. Of the same thickness in all its parts.

5. Attenuate. Tapering gradually towards the top.

6. Incrassate. Growing gradually thicker towards the top.

7. Clavate. Club-shaped. Thick at the end.

8. Nude, or naked.

9. Squamous. Scaly.

10. Foliate, or leafy.

11. Bracteate, or furnished with bractes.

12. Geniculate, or kneed. Bent at the joints.

13. Articulate, or jointed.

PEDUNCULAR. Growing from a peduncle: as same tendrils do.

PEDUNCULATE. Flower or whorl: in opposition to one that is close to the stem, sessile.

PEEBLES, a borough of Scotland, capital of Peebleshire, seated on the Tweed, over which is an elegant bridge. It has manufactures of carpets and serges, and is noted for its excellent beer. On a projecting rock, near the Tweed, stands Nidpath castle; and on an eminence on the E. stands Horseburg castle. It is 22 miles S. of Edinburg. Lon. 3. 7 W. Lat. 55. 40 N.

PEEBLESHIRE, a county of Scotland, 30 miles long and 12 broad; bounded on the N.

by Edinburghshire, E. by Selkirkshire, S. by Dumfriesshire, and W. by Lanerksire. It is divided into 16 parishes; and the number of inhabitants in 1801 was 8735. In this county there is not much arable land. Its hills (among which are those of Tweedsmuir) abound with salubrious springs, and feed numbers of sheep and cattle. The principal rivers are the Tweed and Lynne.

PEEK, in the sea language, is a word used in various senses. Thus the anchor is said to be a-peek, when the ship being about to weigh, comes over her anchor in such a manner that the cable hangs perpendicularly between the hawse and the anchor. To heave a-peek, is to bring the peek so that the anchor may hang a-peek. A ship is said to ride a-peek, when lying with her main and fore-yards hoisted up, one end of her yards is brought down to the shrouds, and the other raised up on end; which is chiefly done when she lies in rivers, lest other ships falling foul of the yards should break them. Riding a broad peek, denotes much the same, excepting that the yards are only raised to half the height. Peek is also used for a room in the hold, extending from the bits forward to the stem: in this room men of war keep their powder, and merchantmen their victuals.

PEEL, a town on the W. coast of the isle of Man, situate on a spacious bay. At the S. extremity of the bay is Peel Isle, a rock of great magnitude and height, on the summit of which is a castle, and the cathedral of the isle, dedicated to St. Germain, the first bishop, who lived in the fifth century. The town is much decayed, and the inhabitants are indolent and poor. Lon. 4. 40 W. Lat. 54. 13 N.

To PEEL. *v. a.* (*peler*, Fr. from *pellis*, Lat.) 1. To decorticate; to flay (*Shakspeare*). 2. (from *pill*, Fr. to rob.) To plunder. According to analogy this should be written *pill*.

PEEL. *s.* (*pellis*, Latin; *pelure*, Fr.) The skin or thin rind of any thing.

PEEL. *s.* (*paelle*, Fr.) A broad thin board with a long handle, used by bakers to put their bread in and out of the oven.

PEELE (Francis), a dramatic writer in the reign of queen Elizabeth, a native of Devonshire; was a student of Christ Church college, Oxford, in 1573, where he took his degree of M. A. in 1579. He was a good pastoral poet, and Wood informs us, that his plays were acted with great applause.

PEE'LER. *s.* (from *peel*.) 1. One who strips or flays. 2. A robber; a plunderer (*Tusser*).

To PEEP. *v. n.* 1. To make the first appearance (*Spenser*). 2. To look slyly, closely, or curiously; to look through any crevice (*Cleaveland*).

PEEP. *s.* 1. First appearance: as, at the peep of day. 2. A sly look (*Swift*).

PEEPER. *s.* Young chickens just breaking the shell (*Bramstead*).

PEEPHOLE. PEEPINGHOLE. *s.* (peep and hole.) Hole through which one may look without being discovered (*Prior*).

PEER. *s.* (*pair*, French.) 1. Equal; one of the same rank (*Davies*). 2. One equal in excellence or endowments (*Dryden*). 3. Companion; fellow (*Ben Jonson*).

PEERS, in our common law, are those who are impannelled in an inquest upon any man, for the convicting or clearing him of any offence, for which he is called in question; and the reason is, because the course and custom of our nation is, to try every man in such a case by his equals, or peers.

PEERS OF THE REALM, are the nobility of the kingdom, and lords of parliament: who are divided into dukes, marquises, earls, viscounts, and barons; and the reason why they are called peers is, because notwithstanding there is a distinction of dignities in our nobility, yet in all public actions they are equal, as in their votes of parliament, and in passing upon the trial of any nobleman.

It seems clearly, that the right of peerage was originally territorial; that is, annexed to lands, houses, castles, &c.; the proprietors and possessors of which were, in right of those estates, allowed to be peers of the realm, and were summoned in parliament to do suit and service to their sovereign; and when the land was alienated, the dignity passed with its appendant. Thus the bishops still sit in the house of lords, in right of succession to certain ancient baronies annexed, or supposed to be annexed, to their episcopal lands. But afterwards, as alienations grew frequent, the dignity of peerage was confined to the lineage of the party ennobled; and instead of territorial, became personal. Actual proof of a tenure of barony became no longer necessary to constitute a lord of parliament; but the record of the writ of summons to him, or his ancestors, was admitted as a sufficient evidence of the tenure.

Peers are now created either by writ or patent; for those who claim by prescription must suppose either a writ or patent made to their ancestors, though by length of time it may be lost. The creation by writ or the king's letter, is a summons to attend the house of peers, by the style and title of that barony which the king is pleased to confer; that by patents is a royal grant to a subject of any dignity and degree of peerage. The creation by writ is the more ancient way; but a man is not ennobled by it unless he actually takes his seat in the house of lords, and therefore the most usual, because the surest way, is to grant the dignity by patent, which ensures to a man and his heirs, according to the limitations thereof, though he never himself makes use of it. 1 Black. 399.

In criminal cases a nobleman is tried by his peers. Peers shall have the benefit of clergy for the first offence of felony without being burned in the hand.

PEERS (House of). See PARLIAMENT.

To PEER. *v. n.* (by contraction from *appeal*.) 1. To come just in sight (*Ben Jonson*). 2. To look narrowly; to peep (*Sidney*).

PEERAGE. *s.* (*pairie*, Fr. from *peer*.)

1. The dignity of a peer (*Swift*). 2. The body of peers (*Dryden*).

Accounts of the peerage of Great Britain, with genealogy, arms, &c. have been published by Kearsley and Stockdale.

PEERIDOM. *s.* (from *peer*.) Peerage.

PEERESS, a woman who is noble by descent, creation, or marriage. For, as we have noblemen of several ranks, so we may have noblewomen: thus king Henry VIII. made Anne Bullen marchioness of Pembroke; king James I. created the lady Compton, wife to sir Thomas Compton, countess of Buckingham, in the lifetime of her husband, without any addition of honour to him. The same king made the lady Finch viscountess of Maidstone, and afterwards countess of Winchelsea, to her and the heirs of her body: and king George I. made the lady Schulenberg duchess of Kendal. If a peeress, by descent or creation, marries a person under the degree of nobility, she still continues noble: but if she obtains that dignity only by marriage, she loses it on her afterwards marrying a commoner; yet, by the courtesy of England, she generally retains the title of her nobility. A countess or baroness may not be arrested for debt or trespass; for though, in respect of their sex, they cannot sit in parliament, they are nevertheless peers of the realm, and shall be tried by their peers, &c.

PEERLESS. *a.* (from *peer*.) Unequalled; having no peer (*Milton*).

PEERLESS PRIMROSE, in botany. See NARCISSUS.

PEERLESSNESS. *s.* (from *peerless*.) Universal superiority.

PEEVISH. *a.* (from *beeish*, *Skinner*.) 1. Petulant; waspish; easily offended; irritable; soon angry; hard to please (*Swift*). 2. Expressing discontent or fretfulness (*Shakspeare*).

PEEVISHLY. *ad.* Angrily; querulously; morosely (*Hayward*).

PEEVISHNESS. *s.* Irascibility; querulousness; fretfulness; perverseness (*King Charles*).

PEEWIT, in ornithology. See LARUS.

PEG. *s.* (*pughe*, Teutonic.) 1. A piece of wood driven into a hole (*Swift*). 2. The pins of an instrument in which the strings are strained (*Shakspeare*). 3. To take a PEG lower. To depress; to sink (*Hudibras*). 4. The nickname of Margaret.

To PEG. *v. a.* To fasten with a peg (*Evel*).

PEGANUM. In botany, a genus of the class didecandria, order monogynia. Calyx five-leaved, or leafless; corol five-petalled; capsule three-celled, three-valved, many-seeded. Four species: Spain, Palestine, Siberia.

PEGASUM STAGNUM, a lake near Ephesus, which arose from the earth, when Pegasus struck it with his foot.

PEGASUS, among the poets, a winged horse sprung from the blood of Medusa, when Perseus had cut off her head. He received his name from his being born, according to Hesiod, near the sources (*πηγῆς*) of the ocean. As soon as he was born, he flew up into heaven, or rather, according to Ovid, fixed

his residence on mount Helicon, where, by striking the earth with his foot, he instantly raised a fountain, thence called Hippocrene. He became the favourite of the Muses, and being tamed by Neptune or Minerva, he was given to Bellerophon to conquer the Chimæra. This monster being destroyed, Pegasus threw down his rider, because he attempted to fly to heaven. Pegasus, however, continued his flight up to heaven, and was placed among the constellations by Jupiter.

PEGASUS. In natural history, a genus of the class pisces, order branchiostega. Mouth beneath; snout retractile; upper jaw elongated, denticulate, ensiform, linear; aperture of the gills single, before the pectoral fins; body compressed downwards, articulate with bony incisions, and mailed; ventral fins behind the pectoral. Three species: 1. *P. draconis*. Dragon-pegasus. Snout conic: inhabits India; from three to four inches long; feeds on worms, the spawn of other fishes and fat earth; body above blueish, with brown, radiate tubercles; beneath broad with a longitudinal eminence in the middle, on which are seated the ventral fins.

2. *P. volans*. Snout ensiform, denticulate; about three inches long: inhabits India.

3. *P. natans*. Snout ensiform, unarmed. Inhabits India: size of *P. draconis*; body broad on the fore-part, and narrowed behind, above yellow-brown, beneath broad, smooth, white. See Nat. Hist. Pl. CLXX.

PEGASUS. In astronomy, the name of a constellation of the northern hemisphere, figured in form of a flying horse. The stars in this constellation in Ptolemy's Catalogue are twenty, in Tycho's nineteen, in Hevelius's thirty-eight, in the Britanic Catalogue eighty-nine, viz. 0, 3, 3, 8, 12, 63.

PEGEMUS, one of the many names by which the chemists have called mercury.

PEGMA. Among the Romans, a wooden machine, used in theatrical entertainments, which was raised and let down by secret engines, whence it was said to grow. See PEGMATES.

PEGMATES, or rather PEGMARES. In antiquity, a name given to certain gladiators, as well as artificers among the Romans. The ancients sometimes exhibited shows of a sort of moving machines, call pegmata: these were scaffolds variously adorned, somewhat after the manner of those now raised for fire-works. These scaffolds, being made to play, and rise aloft, either threw up into the air the matters wherewith they were charged; and, among the rest, men, who were thus sacrificed to afford the people diversion; or else they precipitated them into holes dug in the ground, where they lighted their funeral piles; or finally into the dens of wild beasts. Both the miserable people thus sacrificed, and the workmen that made and played the machine, were called pegmates, or pegmares.

PEGNAFIEL, a town of Spain, in Old Castile, remarkable for its palace, castle, and fortifications; and its cheeses are said to be the best

in Spain. It is seated on the Douero, 20 miles S.E. of Valladolid. Lon. 4. 0 W. Lat. 41. 41 N.

PEGNA MACOR, a town of Portugal, in Beira, with a castle, 40 miles N.W. of Alcantara. Lon. 6. 32 W. Lat. 39. 50 N.

PEGNARANDA, a town of Spain, in Old Castile, 30 miles S.W. of Olmedo. Lon. 4. 8 W. Lat. 40. 59 N.

PEGOMANTIA. (Πεγομαντία.) In antiquity, a species of divination, which was performed with fountain water. See HYDROMANCY.

PEGU, a kingdom of Asia, lying to the S.E. of Bengal. It is bounded on the N. by Burmah, on the W. and S. by the ocean, and on the E. by Laos and Siam. Its products are timber for building, elephants, elephants teeth, bees'-wax, lac, saltpetre, iron, lead, tin, petroleum, very fine rubies, small diamonds, and plenty of lead, of which they make their money. It is very fruitful in corn, roots, pulse, and fruits. The government is arbitrary, for the king's will is a law, and yet he does not often abuse his power. The inhabitants are but thinly clad, and the best among them wear neither shoes nor stockings. The women are much fairer than the men, small but well proportioned. If the wife proves false, the husband may sell her for a slave; and if he go astray, she will give him a dose of poison. There are a vast number of temples in this country, mostly of wood, varnished and gilt. The priests have ground allowed them, which they cultivate for their subsistence; and they are said to be strict observers of morality. They are called talapoins, and inculcate charity as the highest virtue; affirming that religion to be the best which teaches men to do the most good. They have idols in their temples, in a sitting posture, cross-legged, and with very large ears. They have various sorts of music, but the pipe and tabor are esteemed the best. In the low flat part of the country, which is liable to be overflowed, the houses are built upon stakes, and in time of inundations, the inhabitants communicate with each other by boats. Pegu was an independent kingdom, till 1751, when it was reduced, by the king of Burmah, to the state of a dependant province.

PEGU, a town in the kingdom of the same name, above 20 miles in circumference; but not one twentieth part is inhabited, for it was ruined by the king of Burmah. It is seated on a river of the same name, 520 miles S. of Ava. Lon. 96. 30 E. Lat. 18. 10 N.

PEINE, a town of Lower Saxony, in the duchy of Brunswick; famous for a battle fought in 1553, when Maurice, elector of Saxony, and the margrave of Brandenburg were killed. It is 17 miles W. of Brunswick. Lon. 10. 19 E. Lat. 52. 25 N.

PEINE FORT ET DURE, (Lat. *pæna fortis et dura*), signifies a special punishment inflicted on those who, being arraigned of felony, refuse to put themselves on the ordinary trial, but stubbornly stand mute; it is vulgarly called pressing to death. See ARRAIGNMENT.

PEIRCE (James), an eminent dissenting minister, was born at Wapping, in London, in the year 1674, and was educated at Utrecht and Leyden; after which he spent some time at Oxford, in order to enjoy the benefit of frequenting the Bodleian library. He then for two years preached the Sunday-evening's lecture at the meeting-house in Miles-Lane, London, and then settled at Cambridge. In 1713 he was removed to a congregation at Exeter, where he continued till the year 1718; when the Calvinists among the dissenters proposing a subscription to articles of faith to be signed by all the dissenting ministers in the kingdom, several articles were proposed to him and Mr. John Hallet, another dissenting minister at Exeter, in order to their subscribing them. They both refused, imagining this proceeding of their dissenting brethren to be an unworthy imposition on religious liberty and private judgement; for which they were ejected from their congregation. Upon this, a new meeting was opened for them at Exeter, of which Mr. Peirce continued minister till his death, in 1726. He was a man of the strictest virtue, exemplary piety and great learning. He wrote, 1. *Exercitatio philosophica de Homocemeria Anaxagorea*. 2. Thirteen pieces on the Controversy between the Church of England and the Dissenters. 3. Ten pieces on the Controversy about the Ejection at Exeter. 4. Six pieces on the Doctrine of the Trinity. 5. A Paraphrase and Notes on the Epistles of St. Paul to the Colossians, Philippians, and Hebrews. 6. An Essay in favour of giving the Eucharist to Children. 7. Fourteen Sermons.

PEIRESC (Nicolas Claude Fabri), descended from an ancient family of Pisa, in Italy, and born in 1580. He spent five years in study at the jesuits' college, and became famous for his discoveries in antiquities, particularly in medals. He went to Rome in 1600, and staid six months in that capital, as well to view the jubilee as to inspect the monuments of the fine arts; after which he returned to Padua, where he consulted the learned Rabbi Solomon, upon the Hebrew, Samaritan, Syriac, and Arabic languages. His knowledge of the Greek was considerable, and his proficiency in mathematics procured him the friendship of Galileo and Fabricius of Aquapendente. Upon his obtaining the degree of LL. D. at Aix, in 1604, he made a learned speech on the antiquity of the doctorial ornaments. In 1606 he accompanied the French ambassador to England. He died of a suppression of urine, in 1637. His works were numerous, at the head of which stands his *Historia Provinciæ Galliæ Narbonensis*, and the last on the catalogue *Linguae Orientales*, &c.

PEISHORE, or PISHOUR, a considerable city of Hindustan Proper, in the province of Cabul. It is subject to the king of Candahar, and is 50 miles N.W. of Attock. Lon. 96. 54 E. Lat. 32. 44 N.

PEITZ, a town of Upper Saxony, in the Ucker marche of Brandenburg. In the neighbourhood are iron mines, and manufactures of pitch and turpentine. It is 30 miles S.S.W.

of Frankfort on the Oder. Lon. 8. 35 E. Lat. 52. 5 N.

PEKAN, in mastiology. See MUSTELA.

PEKING, the capital of the empire of China, in the province of Pe-tche-li. Its name signifies the Northern Court, to distinguish it from Nan-king, the Southern Court, where the emperor formerly resided. This capital forms an oblong square, and is divided into two cities; one inhabited by Chinese, the other by Tartars. These two cities, exclusive of the suburbs, are nearly 14 miles in circumference. The walls of the city are 28 feet high, 24 thick at the base, and 12 at the top; and there are spacious towers at 70 feet distance from each other. The gates are high, and well arched, supporting buildings of nine stories high; the lowest of which is for the soldiers when they come off guard: they are nine in number, three in the S. wall, and in each of the other sides two. The middle gate, on the S. side, opens into the Tartar or imperial city, which is a space within the general inclosure, about a mile from N. to S. and three-fourths of a mile from E. to W. with a rivulet winding through it. A wall of large red polished bricks, 20 feet high, covered with a roof of tiles painted yellow and varnished, surrounds this space, in which are contained the imperial palace and gardens, the public offices, lodgings for the ministers, the eunuchs, artificers, and tradesmen belonging to the court. Between the other two gates in the S. wall, and the opposite ones on the N. side of the city, run two straight streets, each four miles in length, and 120 feet wide. One street of the same width runs from one of the eastern to the corresponding western gate, but the other is interrupted by the imperial city, round the walls of which it is carried. The other streets branch from these main streets at right angles, and are very narrow. The houses have no windows nor openings to the street, except the great shops; most of them are poorly built, and have only a ground-floor. It is astonishing to see the concourse of people that are in the main streets, yet not one Chinese woman among them, and the confusion occasioned by the number of horses, camels, mules, asses, wagons, carts, and chairs; without reckoning the several mobs which gather about the jugglers, ballad-singers, &c. Persons of distinction have always a horseman to go before them and clear the way. All the great streets are guarded by soldiers, who patrol night and day with swords by their sides, and whips in their hands, to chastise those who make any disturbance, or take them into custody. The little streets have lattice gates at their entrance into the great streets, which are shut up at night, and guarded by soldiers, who suffer no assemblies in the streets at that time. The emperor's palace and garden occupies two thirds of the Tartar city, is surrounded by a brick wall, two miles in length, with pavilions at each corner encompassed by galleries, supported by columns: the architecture of the stupendous pile of buildings of which the palace consists is entirely different from that of the

Europeans; and they are covered with tiles of a shining beautiful yellow. The temples and the towers of Peking are so numerous, that it is difficult to count them. Provisions of all kinds are exceedingly plentiful, they being, as well as the merchandise, brought from all parts by canals from the rivers, and always crowded with vessels of different sizes; and within the walls are several hundred acres of land under cultivation. An earthquake which happened here, in 1731, buried above 100,000 persons in the ruins of the houses. The inhabitants are estimated at 2,000,000. A Russian church is established here, with a seminary, in which the students are permitted to reside for the purpose of learning the Chinese language. Since this establishment, many interesting publications have appeared at Petersburg, relative to the laws, history, and geography of China, translated from the originals published at Peking. This city stands in a fertile plain, 60 miles S. of the great wall. Lon. 116. 27 E. Lat. 39. 54 N.

PELAGIANS, a christian sect who appeared about the fifth or end of the fourth century. They maintained the following doctrines: 1. That Adam was by nature mortal, and, whether he had sinned or not, would certainly have died. 2. That the consequences of Adam's sin were confined to his own person. 3. That new-born infants are in the same situation with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promises with the gospel. 5. That the general resurrection of the dead does not follow in virtue of our Saviour's resurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act; the liberty of the will, and information in points of duty, being sufficient, &c. The founder of this sect was

PELAGIUS, a native of Great Britain; but whether of England, Scotland, or Wales, is as uncertain as it is immaterial. He was born towards the close of the fourth century, and educated in the monastery of Banchor, in Wales, of which he became a monk, and afterwards abbot. In the early part of his life he went over to France, and thence to Rome, where he had the insolence to promulgate certain opinions somewhat different from those of the infallible church. His morals being irreproachable, he gained many disciples; and the dreadful heresy made so rapid a progress, that, for the salvation of souls, it became necessary for the pope to exert his power. Pelagius, to avoid the danger, in the year 409 passed over to Sicily, attended by his friend and pupil Celestius. In 411 they landed in Africa, continued some time at Hippo, and were present at the famous conference between the Catholics and Donatists, which was held at Carthage in 412. From thence they travelled to Egypt, and from Egypt, in 415, to Palestine, where they were graciously received by John, bishop of Jerusalem. In the same year Pelagius was cited to appear before a council of seventeen

bishops, held at Diospolis. They were satisfied with his creed, and absolved him of heresy. The African bishops, however, being displeased with their proceedings, appealed to the Roman pontiff: he first approved, and afterwards condemned, the opinions of Pelagius, who, with his pupil Celestius, was publicly excommunicated; and all the bishops who refused to subscribe the condemnation of the Pelagian heresy were immediately deprived. What became of him after this period is entirely unknown; but it seems very probable that he retired to Banchor, and died abbot of that monastery. He wrote, 1. *Expositiōum in epist. Paulinas*, lib. xiv. 2. *Epistolā ad Demetriadem de virginitate*. 3. *Explanationis symboli ad Damasum*. 4. *Epistolæ ad viduam dūæ*. 5. *De libero arbitrio*. These and many other fragments are scattered among the works of St. Jerome. They are also collected by Garnerius, and published in *Append. Op. Mercatoris*, p. 373. *Cave*.

PELAGIUS I. (Pope). He was a Roman by birth, and ascended the papal chair in 555. He endeavoured to reform the manners of the clergy; and when the city was besieged by the Goths, he obtained from Totila, their general, many concessions in favour of the citizens. He died in 560.

PELAGIUS II. (Pope). He was elected after the death of Benedict I. in 578. He laboured earnestly, but without success, to reconcile the bishops of Istria and Venice to the Roman see; and he opposed John, patriarch of Constantinople, who had assumed the title of oecumenical bishop. Pelagius died of the plague which desolated Rome in 590.

PELAGNISI, an island in the Grecian Archipelago, about eight miles in circumference. Lon. 24. 12 E. Lat. 39. 30 N.

PELAGRA. The disease called the pelagra does not appear to have been noticed by any of our nosologists. Indeed few accounts of it have hitherto been published, although the peculiar symptoms with which it is attended, and the fatal consequences which generally ensue from it, render it equally curious and important. In certain districts, as Milan and Padua in Italy, where it is peculiarly prevalent, it is computed to attack five inhabitants out of every hundred. The following account of this singular disease is extracted from Dr. Jansen's treatise on the subject, who had seen the disease at Milan.

About the month of March or April, when the season invites the farmers to cultivate their fields, it often happens that a shining red spot suddenly arises on the back of the hand, resembling the common erysipelas, but without much itching or pain, or indeed any other particular inconvenience. Both men and women, girls and boys, are equally subject to it. Sometimes this spot affects both hands, without appearing on any other part of the body. Not uncommonly it arises also on the shins, sometimes on the neck, and now and then, though very rarely, on the face. It is sometimes also seen on the breasts of women, where they are

not covered by the clothes, but such parts of the body as are not exposed to the air are very seldom affected; nor has it ever been observed to attack the palm of the hand, or the sole of the foot. This red spot elevates the skin a little, producing numerous small tubercles of different colours; the skin becomes dry and cracks, and the epidermis sometimes assumes a fibrous appearance. At length it falls off in white furfureous scales; but the shining redness underneath still continues, and in some instances remains through the following winter. In the mean time, excepting this mere local affection, the health is not the least impaired, the patient performs all his rural labours as before, enjoys a good appetite, eats heartily, and digests well. The bowels are generally relaxed at the very commencement of the disease, and continue so throughout its whole course. All the other excretions are as usual; and, in females, the menses return at their accustomed periods, and in the proper quantity. But what is most surprising is, that in the month of September, when the heat of the summer is over, in some cases sooner, in others later, the disorder generally altogether disappears, and the skin resumes its natural healthy appearance. This change has been known to take place as early as the latter end of May or June, when it has only been in its earliest stage. The patients, however, are not now to be considered as well; the disease hides itself, but is not eradicated; for no sooner does the following spring return, but it quickly reappears, and generally is accompanied with severer symptoms. The spot grows larger, the skin becomes more unequal and hard, with deeper cracks. The patient now begins to feel uneasiness in his head, becomes fearful, dull, less capable of labour, and much wearied with his usual exertions. He is exceedingly affected with the changes of the atmosphere, and impatient both of cold and heat. Nevertheless, he generally gets through his ordinary labour, with less vigour and cheerfulness indeed than formerly, but still without being obliged to take to his bed; and, as he has no fever, his appetite continues good, and the chylopoietic viscera perform their proper functions. When the pelagra has even arrived at this stage, the returning winter, nevertheless, commonly restores the patient to apparent health; but the more severe the symptoms have been, and the deeper root the disease has taken, the more certainly does the return of spring produce it with additional violence. Sometimes the disease in the skin disappears, but the other symptoms remain notwithstanding. The powers both of the mind and body now become daily more enfeebled; peevishness, watchings, vertigo, and at length complete melancholy supervene. Nor is there a more distressing kind of melancholy any where to be seen than takes place in this disease. "On entering the hospital at Legnano," says Dr. Jansen, "I was astonished at the mournful spectacle I beheld, especially in the women's ward. There they all sat, indolent, languid, with downcast looks,

their eyes expressing distress, weeping without cause, and scarcely returning an answer when spoken to; so that a person would suppose himself to be among fools and mad people: and indeed with very good reason; for gradually this melancholy increases, and at length ends in real mania.

"Many, as I had an opportunity of observing in this hospital, were covered with a peculiar and characteristic sweat, having a very offensive smell, which I know not how better to express than by comparing it to the smell of mouldy bread. A person accustomed to see the disease would at once recognize it by this single symptom. Many complained of a burning pain at night in the soles of the feet, which often deprived them of sleep. Some with double vision; others with fatuity; others with visceral obstructions; others with additional symptoms. Nevertheless, fever still keeps off, the appetite is unimpaired, and the secretions are regularly carried on. But the disease goes on increasing, the nerves are more debilitated, the legs and thighs lose the power of motion, stupor or delirium come on, and the melancholy terminates in confirmed mania. In the hospital at Legnano, I saw both men and women in this maniac state. Some lay quiet; others were raving, and obliged to be tied down to the bed, to prevent them from doing mischief to themselves and others. In almost all these the pulse was small, slow, and without any character of fever. One woman appeared to have a slight degree of *furor uterinus*; for at the sight of men she became merry, smiled, offered kisses, and by her gestures desired them to come towards her. Some were occupied in constant prayers; some pleased themselves with laughter, and others with other things. But it was remarkable, that all who were in this stage of the disease had a strong propensity to drown themselves. They now begin to grow emaciated, and the delirium is often followed by a species of tabes. A colliquative diarrhoea comes on, which no remedy can stop, as also has been observed in nostalgia. Sometimes in the pelagra the diarrhoea comes on before the delirium, and the delirium and stupor mutually interchange with each other. The appetite often suddenly failed, so that the sick will sometimes go for near a week without tasting food. Not uncommonly it returns as suddenly, so that they eagerly devoured whatever was offered them, and this even at times when they are horribly convulsed. The convulsions with which they are attacked are most shocking to see, and are of almost every kind, catalepsy excepted, which has been described by writers. I saw one girl in bed, who was violently distorted by opisthotonos every time she attempted to rise. Some are seized with emprosthotonos; and others with other species of tetanus. At length syncope and death close the tragedy, often without any symptom of fever occurring through the whole course of the disease. The first stage of the pelagra, in which the local affection only takes place, Dr. Jansen observes, continues in some instances for a great length

of time; persons being occasionally met with in whom it has lasted six or eight, or even fifteen years, disappearing regularly every winter, or returning again in the spring. This occasions some of the inhabitants to pay little attention to it; although, in other cases, it reaches its greatest height after the second or third attack. It appears that this disease is not infectious, and that the causes producing it are yet unascertained. It has been supposed by some to arise from the heat of the sun's rays; and hence it is now and then called *mal de sol*; but this does not produce any similar disease in other parts of the world, where it is in an equal or even much greater degree than at Milan; no disease in any respect resembling it having hitherto been noticed in such regions, except the lepra asturiensis described by Thiery, and after him by Sauvages. In this a tremour of the head and trunk of the body takes place, which does not happen in the pelagra. This, however, is the principal difference in the two diseases.

PELARGONIUM. Crane-bill. In botany, a genus of the class monadelphia, order heptandria. Calyx five-parted, the upper division ending in a capillary, nectariferous tube running down the peduncle; petals five irregular; filaments ten unequal, three, and sometimes five of them barren; fruit beaked, separated into five capsules, each tipped with a spiral awn bearded on the inside. A hundred and twenty-three species; one or two natives of Australasia, the rest Cape plants. They must be thus divided into tribes...

- A. Stemless; root rapaceous; umbel compound.
- B. Nearly stemless; root tuberous.
- C. Herbaceous, or somewhat shrubby.
- D. Shrubby; leaves undivided, not angular.
- E. Shrubby; leaves angular, lobed, or palmate.
- F. Shrubby; leaves three-cleft, and ternate.
- G. Shrubby; leaves pinnatifid and pinnate.
- H. Shrubby; leaves decomposed and more than decomposed.

Nearly thirty varieties of this genus are cultivated in our gardens, many of them possessing a flower nearly resembling that of geranium. They may all be increased by seeds sown in pots in kitchen-garden mould in an early part of the spring, and plunged into hot-beds. As they grow up they should be gradually accustomed to the open air, in order to be placed out in it in the summer season in sheltered situations. The shrubby sorts, however, are more commonly increased by cuttings of the young branches, which should be planted in a shady border in the summer, or in pots plunged into a hot-bed; which last is the best method. All are highly ornamental, and afford considerable variety in collections of green-house or pleasure ground plants.

PELASGI, a people of Greece, supposed to be one of the most ancient in the world. They first inhabited Argolis in Peloponnesus, which from them received the name of Pelasgia, and about 1883 years B. C. they passed into Æmo-

nia, and were afterwards dispersed in several parts of Greece. From these different changes of situation in the Pelasgians, all the Greeks are indiscriminately called Pelasgians, and their country Pelasgia, though it should be confined to Thessaly, Epirus, and Peloponnesus. The Pelasgians seem to have received their name from Pelasgus, the first king, and founder of their nation, who was the son of Jupiter and Niobe.

PELATÆ, among the ancient Athenians, were free-born citizens, who were reduced by poverty to the necessity of serving for wages.

PELATO. Salpingius, in myology. See CIRCUMFLEXUS.

PELECANUS. Pelican. In zoology, a genus of the class aves, order anseres. Bill straight, hooked at the point, and furnished with a nail; nostrils an obliterated slit; face nakedish; legs equally balancing the body, all the four toes palmate. Thirty-one species, scattered over the globe; three or four of them common to our own country. These birds are extremely expert at catching fishes with their long bills, and are often tamed for that purpose; they are gregarious and very voracious: the claw of the middle toe is frequently serrate. The following are the chief species:

1. *P. enocrotalus*. White pelican. White; gullet pouched; bill from fifteen to sixteen inches long, red, but when young, yellow; upper mandible depressed, broad, the lower forked; gular pouch flaccid, membranaceous, capable of great distention: irids hazle; gape of the mouth large; head naked at the sides, covered with a flesh-colour skin.

The white pelican is by far the largest bird of this genus, and is even supposed to exceed, in size, the swan, and albatross; but notwithstanding its size, it supports itself easily upon the air, and darts with great rapidity upon its prey; being furnished with such enormous wings, that, when these are extended, the breadth of the bird is from ten to twelve feet. It feeds, like the cormorant, upon fishes which it catches by diving: like the cormorant, too, it is universally spread over all the warm latitudes, of both the old and new continents. In some places, however, pelicans are more numerous than in others; for travellers assert, that the lakes of Judea and Egypt, and the rivers Nile and Strymon, when viewed from the mountains, appear white, with the vast flocks of these birds that continually cover their surface.

They are seen issuing forth to the tracts where fishes abound, every morning, when they continue rising up into the air, and diving into the water, by turns, till they have filled the large bag under their chin. After they have thus collected a sufficient store of provisions, they retire to the cliff of some neighbouring rock, till it is digested. There they remain, slumbering in a profound apathy; till roused in the evening, by the calls of their voracious appetite, they again resume their labours.

As in the other birds of this genus, the four toes of the pelican are all directed forward, and completely palmated; the legs and beak are of a pale red, varying according to the age of the bird. The latter is of the enormous length of eighteen inches; is thick at the base, but tapers off towards the point, where it terminates in a hook. The under mandible consists of two flexible branches, to each of which are attached the sides of that large bag, which extends from the point of the bill to the

throat. This bag, when empty, the bird has a power of contracting into a small size, under the lower chap; when extended, however, it is capable of containing above ten quarts of water, and will admit a man's leg. This extraordinary pouch consists of a skin, covered with a short down, smooth and soft, like silk.

This bag of the pelican may be considered as its crop; for it serves all the purposes of that intestine in other birds: in other birds, it is placed at the bottom; but, in this, at the top of the gullet, where, having less warmth to aid digestion, the food is carried to the young in a more fresh and sound state. In disgorging the food for her family, the mother presses the bottom of her sack upon her breast, and thus discharges its contents; hence the absurd fable of her opening her breast, and feeding her young with her blood.

Nothing can exceed the torpid and indolent habits of these birds, but their gluttony; it is only the powerful stimulation of hunger that will induce them to change their situation, or ascend into the air. They must, however, fly or starve; and when once they stir abroad, they will each devour, at a single meal, as many fishes as would satisfy six men. They commit prodigious devastation, both upon the fresh water and the sea; and will swallow a fish of eight pounds weight. So great is their voracity, that, on a failure of fishes, they will devour rats, and other small quadrupeds.

The indolent habits of the pelican characterize every part of its economy. After its evening labours are over, as if spent with the fatigues of the day, it retires to a tree near the shore, on which it perches all night, and often a great part of the following day, in dismal solemnity, and apparently half asleep. The invincible laziness of the female allows her to make no preparation for incubation, or for the protection of her young, when excluded. She drops her eggs upon the bare ground, to the number of five or six, without seeming to have any choice in the place where they are laid. Her attachment to the place and affection for her young inspire her with no courage in defending her offspring: she tamely sits and suffers her eggs to be taken from under her; and, now and then, only ventures to peck, or cry out, when a person offers to beat her away.

The young, when excluded, are fed with the fishes that have been, for some time, macerated in her bag. They are easily tamed; and, whatever food is given them, they always first commit it to the bag, and afterwards swallow it at their leisure. They are both useless and disagreeable domestics; for their gluttony is insatiable, and their flesh is so unsavory, as to be rejected and despised by the savages. Great numbers are killed, indeed, by the natives of America, for the sake of their bags, which they convert into purses, and tobacco pouches. When carefully prepared, this membra becomes as soft as silk; and is, sometimes, embroiled by the Spanish ladies for work-bags. In Egypt, the sailors use it, while still attached to the two under chaps, for holding water or baling their boats.

2. *P. carbo*. Cormorant, or corvorant. Tail rounded; body black; head subcercated; bill blackish, the base of the lower mandible covered with a yellowish skin, extending under the chin and forming a pouch; irids green, chin white surrounded with a yellowish arch; tail long, lax, feathers fourteen; thighs with a white spot dotted with black; legs black; size nearly that of a goose: the black plumage of the body ornamented, in certain aspects with rich glosses of green and blue.

PELECANUS.

This species has been found by navigators in almost every part of the ocean, where its flesh, although extremely rancid, affords a repast, of which the sailors sometimes gladly partake. The most frequent residence of the cormorant, when on shore, is the high cliffs of those stupendous rocks which hang over the sea, such as the precipices of St. Kilda. There, to the spectator, at the height of three quarters of a mile above the surface of the sea, the vast waves that roll between the new and old world appear like the curl raised on a lake by a gentle breeze. On these tremendous heights, the roaring of the Atlantic is heard like the soft murmurs of a brook; and the cormorant, together with thousands of water-fowls that skim below, seems scarcely so large as a swallow.

The cormorant is, perhaps, the most voracious of all birds, owing to the vast number of worms that fill its intestines, and accelerate the progress of digestion. Spurred on by an insatiable appetite, it dives into the sea like an arrow, and with such well-directed aim, that its prey seldom escapes. It remains under the water sometimes for a considerable time, but seldom appears above its surface, without a fish crosswise in its bill. In order to swallow the fish, when thus caught, it tosses it up into the air, and, with remarkable agility, seizes it by the head, before it reaches the water: in that position, by dilating its throat, it devours a fish apparently much thicker than its own neck.

In England, this bird was formerly domesticated, and trained to fish for its owner. When thus employed, a ring was fastened round its neck, to prevent it from swallowing its prey; and, as often as it caught a fish, it was instructed to carry it to its master. In China, the inhabitants still avail themselves of the service of the cormorant in fishing. One person can manage a great number of them, which he carries out hooded upon the prow of his boat into a lake. On a signal given, they disperse over the lake; and each, according to his success, returns loaded to his master, who receives his booty, and again dispatches him to his employment. When the fisherman has caught what he judges to be sufficient, he calls in his birds, and unties their necks; and either feeds them with a part of what they have taken, or sends them back to fish on their own account.

It is only hunger which gives activity to the cormorant: for, when glutted with food, it is the most dull and indolent of all birds: it will then remain, for five or six hours, without motion, in a state of listless apathy.

3. *P. graculus*. Shag. Sometimes, though erroneously, called crane. Tail rounded; body black, beneath brown; tail-feathers twelve: head and neck black with a green gloss; middle of the belly dusky; legs black. Inhabits northern Europe and Iceland: two and a half feet long.

Another variety found near the Cape, with yellow chin and wedged tail.

A third variety, blackish, beneath brown; feathers above edged with black: inhabits Cayenne, and the Caribbee islands: twenty-six inches long.

The general manners of this variety agree with those of the cormorant; they breed in the same places; and what is a singularity in webfooted birds, both will perch upon and build in trees; both swim with their heads quite erect, and are shot with difficulty, for like the grebes and divers, as soon as they see the flash of a gun they pop under water, and never rise but at a considerable distance.

4. *P. Sula*. Booby. Tail wedged, body whit-

ish; primary quill-feathers tipped with blackish; face red; bill grey, brownish at the base; irids pale-ash; chin bald, yellowish; body beneath white; legs yellowish. Inhabits South America and the neighbouring isles.

These birds are also extremely indolent, and allow themselves to be taken on the rigging of ships, or knocked down with sticks, till a whole flock be massacred to the very last bird. With the same senseless imbecility they abandon themselves to the depredations of the man-of-war bird. These birds no sooner perceive them, than they dive upon them from the air; not to kill them, but with an intention to make them disgorge the fish they may have swallowed. The cowardly booby generally vomits its prey, on the first attack; and again undertakes the task of searching for new spoils, which, when acquired, expose it to new insults from these invaders. Sometimes the booby does not discharge its load upon the first attack, but utters doleful cries, as if calling for help. The man-of-war bird, in this case, still pursues, redoubling his strokes, without relaxation or pity, till the terrified animal disgorges all its fish, which are snatched up by the voracious plunderer, before they reach the water.

The booby most common in the West Indies is of a middle size, between that of a goose and a duck. Its length, from the tip of the bill to that of the tail, is about two feet and an half: its bill is about five inches; and its tail upwards of ten.

5. *P. Aquilus*. Frigate pelican. Tail forked; body and orbits black; bill red. Male: pouch deep red; wing-coverts rufous. Female: belly white. Inhabits within the tropics; three feet long; extent of the wings fourteen feet; builds in trees or rocks, and lays one or two flesh-colour eggs spotted with red. In consequence of the great strength and extent of its wings, this bird flies often so high as hardly to be seen, and to a distance from land so daring and extensive as to be often the sole object between the heavens and the sea, that presents itself to the eye of the wearied sailor. It passes over immense tracts of the ocean, at one flight; and when a single day is not sufficient, it continues its route during the darkest night; only stopping for refreshment in places where its food is abundant. From the immense size of its wings, this bird raises itself into the clouds; and while the storm roars below, it can look down from its elevated retreat, where it enjoys a perfect calm, upon the furious agitation of the elements beneath it. At other times, it swims with an easy motion through the tranquil air, in quest of its prey, or hangs motionless above the water, watching an opportunity of darting upon the devoted animal which shall first appear upon its surface.

Thus equipped for plunder, the frigate pelican is one of the most formidable tyrants of the ocean. Like the eagle upon land, he exercises a sort of dominion over the other aquatic tribes: happily, however, for their security, he seldom extends his excursions beyond the tropics, although he is found in the torrid zone, through every part of the globe. We have already seen with how much rigour he tyrannises over the tribe of boobies, in making them disgorge their food, after it is swallowed. When in flocks, sometimes their audacity has prompted the man-of-war birds to brave man himself. Upon the island of Ascension, a cloud of them attacked a crew of French sailors; and, till some of them were struck down, endeavoured to snatch the meat from their hands.

But the length of their wings, which gives these

birds such rapidity in the air, serves only to embarrass them when upon the ground. When perched, they have the same difficulty in taking flight as the booby; consequently they are sometimes knocked down, before they can make their escape. It is, probably, owing to the excessive length of their wings, that these, and some others of the palmated birds, perch upon trees, and the points of rocks, as from such places they can most easily launch into the air.

6. *P. Bassanus*. Gannet. Tail wedged; body white; bill and primary quill-feathers black; face blue; irids yellowish; tail-feathers twelve.

7. Another variety, brown spotted with white, beneath white, orbits naked, blackish.

8. A third variety, brown with triangular white spots, beneath whitish, spotted with brown; bill, wings, tail and legs brown.

This last variety inhabits Cayenne: the two former Europe and America.

The gannets are birds of passage, and make their appearance in the British isles in the summer season. They arrive in the month of March, and depart in August or September, according as they have been more or less disturbed in the business of nidification; those whose nests have not been plundered being always soonest ready to depart. The chief of their food consisting in herrings, it is probable that their arrival and departure are influenced by the motions of these fishes, which they are seen constantly attending during their whole circuit round the British islands. Hence the gannet is a bird extremely useful to fishermen, in pointing out the tracts which the shoals of herring pursue. It migrates southward in winter, after a similar food, as far as the coast of Portugal, where it is seen diving for pilchards, in the mouth of the Tagus.

In the breeding season, the gannets retire to the high rocks of the small uninhabited islands round the coast. They are found in vast numbers upon the isle of Ailsa, in the frith of Clyde; upon the rocks of St. Kilda, near the Orkneys; upon the Bass, in the vicinity of Edinburgh; and upon the Skelig isles, off the coast of Ireland. The surface of these dreary precipices is almost entirely covered, in the months of May and June, with nests, eggs, and young birds. The immense numbers of gannets and other birds, that fly around these rocky isles, appear, to a person at some distance, like a hive of bees: and, when he approaches the foot of the rocks, the air is immediately darkened with the vast flocks that rise from their nests; and so loud is their noise, that he can hardly hear the voice of a person standing by him.

The nests of the gannets are formed generally of sea-weeds, or any substance found floating upon the water. The female lays only one egg in the year; but, if that be carried away, she will lay twice, and even thrice, to fulfil the purposes of nature. The young are of a much darker hue than the old birds: they remain in their nests till they be almost full size, where they grow immensely fat. In that state they are taken, and dispersed among the inhabitants, who prize their flesh rather as a kind of variety, and a fashionable dish, than as an agreeable food. In St. Kilda, however, the natives view them in a very different light. They constitute the principal support of that half-famished people, through the year; and we are assured, that no fewer than twenty-two thousand young birds are consumed annually, besides a vast quantity of eggs.

Nor is this food, indifferent as it must prove on

constant repetition, easily procured; for the wretched inhabitants who go in quest of it are let down by a rope from the top of the precipice, and hang dangling in the air, sometimes two hundred fathoms from the ground. They are sometimes in danger from the insecure footing of those who hold the rope above, but more frequently from the tumbling down of loose stones by the swinging of the rope. When the person thus suspended has beat down all the young birds around, with his fowling staff, he is raised or lowered to a different part of the rock, as occasion requires; and, when he has completely destroyed all in one quarter, he is removed to another. In this adventurous manner do the inhabitants of the northern regions provide their annual stock of food. Both the eggs and fowls, which are thus procured at the hazard of their lives, are preserved in small pyramidal stone buildings, covered with ashes, to defend them from moisture. See Nat. Hist. Pl. CLXXXIV.

PELECOIDES, or HATCHET-FORM, in geometry, a figure in form of a hatchet. As the figure ABCDA, contained under the semicircle BCD and the two quadrantal arcs AB and AD. Pl. 129. fig. 8.

The area of the pelecoides is equal to the square AC, and this again is equal to the rectangle BE. It is equal to the square, because the two segments AB and AD, which it wants of the square on the lower part, are compensated by the two equal segments BC and CD, by which it exceeds on the upper part. And the square is equal to the rectangle BE, because the triangle ABD, which is half the square, is also half the rectangle BE of the same base and height with it.

PELEGRINO, a mountain on the N. coast of Sicily, nearly two miles W. of Palermo. On this mount is a cavern, in which is the image of St. Rosolia, who is said to have died here; and round the cave of this saint (who is the patroness of Palermo) a church is built, where priests attend, to watch the precious relics, and receive the offerings of the pilgrims.

PELETHITES. The Pelethites and Cherethites were famous under the reign of king David. They were the most valiant men in the army of that prince, and had the guard of his person. See Ezekiel xxv. 16. Zephaniah ii. 5. 1 Samuel xxx. 14. and 2 Samuel xv. 18. and xx. 7. and Patrick's Comm. Pool's Annot. and Delany's History of the Life of David.

PELETHRONII, an epithet given to the Lapithæ, because they inhabited Pelethronium, in Thessaly; or because one of their number bore the name of Pelethronius. It is to them mankind are indebted for the invention of the bit with which they tamed their horses, &c.

PELEUS, in fabulous history, a king of Thessaly, son of Æacus and Endeis, the daughter of Chiron. He married Thetis, one of the Nereids, and was the only one among mortals who married an immortal. Being accessory to the death of his brother Phocus, he retired to the court of Eurytus, who reigned at Phthia. He was purified of his murder by Eurytus, who gave him his daughter Antigone in marriage. Some time after this, Peleus and Eurytus went to the chase of the Calydonian boar, where the

father-in-law was accidentally killed by an arrow which his son-in-law had aimed at the beast. This unfortunate event obliged him to retire to Iolchos. Here Astydamia, the wife of Acastus, king of the country, became enamoured of him, and when she found him insensible to her passion, she accused him of attempts upon her virtue. The monarch did not put him to death, but caused him to be tied to a tree on mount Pelion, that he might become the prey of the wild beasts of the place; but Jupiter, who knew the innocence of Peleus, ordered Vulcan to set him at liberty. Peleus afterwards punished the ill-treatment which he had received from Acastus. He forcibly took Iolchos, drove the king from his possessions, and put to death the wicked Astydamia. After the death of Antigone, Peleus courted Thetis, who rejected his suit because he was a mortal. Having offered a sacrifice to the gods, Proteus at length informed him that to obtain Thetis he must surprise her asleep in her grotto, near the shores of Thessaly. This advice was followed, and Thetis, unable to escape from the grasp of Peleus, at last consented to marry him. Their nuptials were celebrated with the greatest solemnity by all the gods, who made them each the most valuable presents. The goddess of discord was the only one of the deities who was not present. (See DISCORDIA, PARIS.) From the marriage of Peleus and Thetis was born Achilles. (See ACHILLES.) The death of Achilles was the source of grief to Peleus, and Thetis, to comfort her husband, promised him immortality; and ordered him to retire into the grottos of the island of Leuce, where he would see and converse with the manes of his son.

PELEW ISLANDS, or PALAOS, a group of islands in the Pacific ocean, lying between 134 and 136 E. lon. and 6 and 8 N. lat. They are encircled on the W. side by a reef of coral; and the names of some of the principal are Oroolong, Emungs, Emillegue, Artingal, Co-rooraa, and Pelelew. They are well covered with trees of various kinds and sizes; and every part of that called Co-rooraa, to which Pelew appeared to be the capital, seemed to bear the marks of industry and good cultivation. Capt. Wilson, of the Antelope East India packet, who was wrecked here in 1783, represents the natives simple in their manners, delicate in their sentiments, friendly in their disposition, and, in fine, a people that do honour to the human race. The astonishment which those, who first discovered the English, manifested on seeing their colour, plainly showed, that they had never before seen a white man. They had no idea of the nature of powder and shot, and were exceedingly amazed on seeing its effects. Their principal arms consist of bamboo darts, from five to eight feet long, pointed with the wood of the betel-nut tree; but there are short ones for different marks, which are thrown by means of a stick two feet long. The chiefs wear a bone round one of their wrists, in the form of a bracelet, which, being a mark of great honour conferred by the king, is never to

be parted with but with life. They are not all of the same degree, as appeared from a difference in the bone they wore. Captain Wilson was invested with the highest order of the bone. With respect to property in these islands, a man's house or canoe is considered as his own, as is also the land allotted to him, as long as he occupies and cultivates it; but whenever he removes to another place, the ground reverts to the king. The natives make canoes out of the trunks of trees, some large enough to carry 30 men. Yams and coconuts, being their chief articles of subsistence, are attended with the utmost care; and the milk of the latter is their common drink. On particular occasions, they add to their ordinary fare certain sweetmeats, and a sweet beverage, obtained by the aid of a syrup, extracted either from the palm-tree or the sugar-cane. The houses are raised about three feet from the ground, the foundation beams being laid on large stones, whence spring the upright supports of their sides, which are crossed by other timbers grooved together, and fastened by wooden pins; the intermediate space being closely filled up with bamboos and palm-tree leaves, platted together. The tops of the house are covered with bamboos and palm-tree leaves; and the inside is without any division, forming one great room. As to domestic implements, they have little baskets, nicely woven from slips of the plantain-tree, and wooden baskets with covers, neatly carved and inlaid with shells. No one goes abroad without a basket, which usually contains some betel-nut, a comb, knife, and a little twine. The best knives are made of a piece of the large mother-of-pearl oyster, ground narrow, and the outward side a little polished. The combs are made of the orange-tree, of which there are a few of the Seville kind; the handle and teeth are fastened in the solid wood. The fishing hooks are of tortoise-shell; and twine, cord, and fishing nets, are well manufactured from the husks of the coconut. Of the plantain leaf are formed mats, which serve the people as beds. They also use a plantain leaf at meals, instead of a plate; and the shell of a cocoa-nut supplies the place of a cup. There are vessels of a kind of earthen ware, of a reddish brown colour, in which they boil their fish, yams, &c. A bundle of coconut husks serves them for a broom; and thick bamboos, with bores five or six inches in diameter, are their buckets or cisterns. The shell of the tortoise is here remarkably beautiful; and the natives have discovered the art of moulding it into little trays or dishes, and spoons. Some of the great ladies have also bracelets of the same manufacture, and earrings inlaid with shells. The natives, in general, are stout and well made, rather above the middling stature, and of a deep copper colour. Their hair is long, and generally formed into one large loose curl round their heads. The men are entirely naked: but the women wear two little aprons, one before, the other behind. Both sexes are tattooed, and have their teeth made black by art. They are very expert at

swimming; and the men are such admirable divers, that they will readily fetch up any thing from the bottom of the sea. Such an opinion had the king of the island entertained of the English, that, on their departure, he suffered his second son, Lee Boo, to accompany them to England, where this hopeful youth died of the smallpox in 1784. The East India Company erected a monument over his grave in Rotherhithe churchyard. These islands are encircled on the W. side by a reef of coral.

PELF. *s.* (In low Latin, *pelfra.*) Money; riches (*Sidney. Swift.*)

PELIAS, the twin brother of Neleus, was son of Neptune by Tyro, the daughter of Salmones. His birth was concealed by his mother, who wished her father to be ignorant of her incontinence. He was exposed, but his life was preserved by shepherds, who named him Pelias, from a spot of the colour of lead in his face. Some time after this, Tyro married Cretheus, king of Iolchos. Meantime Pelias visited his mother, and after the death of Cretheus, he unjustly seized his kingdom, which belonged to the children of Tyro. But Jason, the son of Æson, the eldest of the children of Cretheus, afterwards boldly demanded the kingdom which he had usurped. Pelias then, in order to divert his attention, told him he would voluntarily resign the crown, if he went to Colchis to avenge the death of Phryxus, whom Æetes had cruelly murdered. This expedition, which was likely to be attended with much glory, was readily undertaken by Jason. (See JASON). Upon the return of Jason from Colchis, the daughters of Pelias, called Peliades, solicited Medea (see MEDEA) to restore their father to youth, as she had Æson, her father-in-law; but after the Peliades had, by her directions, cut their father's body to pieces, and had drawn all the blood from his veins, on the assurance that Medea would replenish them by her incantations, Medea suffered the flesh to be totally consumed in a cauldron of boiling water, and refused to give the Peliades the promised assistance. The Peliades were four in number, Alceste, Pisidice, Pelopea, and Hippothoe, to whom Hysinus adds Medusa. After this parricide, they fled to the court of Admetus, where Acastus, the son-in-law of Pelias, pursued them, and took their protector prisoner. The Peliades died, and were buried in Arcadia.—2. A Trojan chief, wounded by Ulysses during the Trojan war. He survived the ruin of his country, and followed the fortune of Æneas. (*Virg.*)—The ship Argo is called Pelias arbor, built of the trees of mount Pelion.—The spear of Achilles. (See PELION.)

PELICAN, in ornithology. See PELECANUS.

PELIGNI, a people of Italy who dwelt near the Sabines and Marsi. Corfinium and Sulmo were the chief towns of this country.

PELION and PELIOS, a celebrated mountain of Thessaly. In their wars against the gods, the giants, as the poets mention, placed mount Ossa upon Pelion, to scale the heavens

with more facility. The celebrated huge spear of Achilles, which none but the hero could wield, had been cut down on this mountain, and thence called Pelias. It was a present from his præceptor Chiron.

PELISSA, a town of Lower Hungary, capital of a county of the same name. It is seated near the Danube, 15 miles N. of Buda. Lon. 18. 20 E. Lat. 47. 40 N.

PELISSANE, a town of France, in the department of the Mouths of the Rhone, 15 miles W.N.W. of Aix. Lon. 5. 21 E. Lat. 43. 26 N.

PELL (John), an English mathematician of Southwyke, Sussex, was born in 1610, educated at Stenning school, and at 13 entered at Trinity college, Cambridge, where he applied himself to mathematics with unusual assiduity. After taking his master's degree, he was incorporated at Oxford in 1631, and by his various publications he acquired so much reputation, that he was invited in 1639 to fill up a professor's chair at Amsterdam, to which he succeeded 1643. In 1646 he settled at Breda as professor of philosophy and mathematics, at the request of the prince of Orange, and in 1652 returned to his native country. In 1654 he was sent by Cromwell as English resident to Switzerland, and returned a little before the protector's death. In 1661 he was ordained by the bishop of Lincoln, and obtained from the crown the rectory of Fobbing in Essex, to which the bishop of London afterwards added the rectory of Lavingdon in that county. Though respectable as a scholar, and a man of science, Dr. Pell was unfortunately very inattentive to the state of his domestic affairs, and consequently he became poor in his old age, and was even confined in the king's bench as a debtor. He died 1685, and was interred by the charity of Busby, master of Westminster school, and Sharp, rector of St. Giles'.

Pell was the author of various works, and among them the following:

1. An Exercitation concerning Easter; 1644, in 4to.
2. A Table of 10,000 square numbers, &c. 1672, folio.
3. An Inaugural Oration at his entering upon the Professorship at Breda.
4. He made great alterations and additions to Rhonius's Algebra, printed at London 1668, 4to, under the title of, An Introduction to Algebra; translated out of the High Dutch into English, by Thomas Branker, much altered and augmented by D. P. (Dr. Pell). Also a Table of Odd Numbers, less than 100,000, shewing those that are incomposite, &c. supputated by the same Thomas Branker.
5. His Controversy with Longomontanus concerning the Quadrature of the Circle; Amsterdam, 1646, 4to.

He likewise wrote a Demonstration of the 2d and 10th books of Euclid; which piece was in MS. in the library of lord Brereton in Cheshire: as also Archimedes's Arenarius, and the greatest part of Diophantus's six books of

Arithmetic; of which author he was preparing, August, 1644, a new edition, in which he intended to have corrected the translation, and made new illustrations. He designed likewise to publish an edition of Apollonius, but laid it aside, in May, 1645, at the desire of Golius, who was engaged in an edition of that author from an Arabic manuscript given him at Aleppo eighteen years before. Letters of Dr. Pell to sir Charles Cavendish, in the Royal Society.

Some of his manuscripts he left at Brereton in Cheshire, where he resided some years, being the seat of William lord Brereton, who had been his pupil at Breda. A great many others came into the hands of Dr. Busby; which Mr. Hook was desired to use his endeavours to obtain for the Society. But they continued buried under dust, and mixed with the papers and pamphlets of Dr. Busby, in four large boxes, till 1755; when Dr. Birch, secretary to the Royal Society, procured them for that body, from the trustees of Dr. Busby.

The collection contains not only Pell's mathematical papers, letters to him, and copies of those from him, &c. but also several manuscripts of Walter Warner, the mathematician and philosopher, who lived in the reigns of James I. and Charles I.

Dr. Pell invented the method of ranging the several steps of an algebraical calculus, in a proper order, in so many distinct lines, with the number affixed to each step, and a short description of the operation or process in the line. He also invented the character $\div$ for division, $\otimes$ for involution, and μ for evolution.

PELLA, a celebrated town of Macedonia, which became the capital of the country, after the ruin of Edessa. Philip, king of Macedonia, was educated there, and Alexander the Great was born there, whence he is often called Pellæus juvenis. The tomb of the poet Euripides was in the neighbourhood.

PELLERIN, a town of France, in the department of Lower Loire, situate on the Loire, with a harbour for small vessels, 10 miles N. of Nantes, and 13 S.E. of Painbœuf. Lon 1. 44 W. Lat. 47. 23 N.

PELLET. *s.* (from *pile*, Lat. *pelote*, Fr.) 1. A little ball (*Sandys*). 2. A bullet; a ball to be shot (*Ray*).

PELLETED. *a.* (from *pellet*.) Consisting of bullets (*Shakspeare*).

PELLICULE. *s.* (*pellicula*, Lat.) 1. A thin skin (*Sharp*). 2. It is often used for the film which gathers upon liquors impregnated with salt or other substance, and evaporated by heat.

PELLISON, or PELLISON FONTANIER (Paul), one of the finest geniuses of the 17th century, was the son of James Pellison counsellor at Castres. He was born at Beziers in 1624, and educated in the Protestant religion. He studied with success the Latin, Greek, French, Spanish, and Italian tongues, and applied himself to the reading the best authors in these languages; after which he studied the law at Castres with reputation. In 1652 he purchased the post of secretary to the king, and five years after became first deputy to M. Fou-

quet. He suffered by the disgrace of that minister; and in 1661 was confined in the Bastille, from whence he was not discharged till four years after. During his confinement he applied himself to the study of controversy; and in 1670 abjured the Protestant religion. Louis XIV. bestowed upon him an annual pension of 2000 crowns; and he likewise enjoyed several posts. In 1676 he had the abbey of Giment, and some years after the priory of St. Orens at Auch. He died in 1693. His principal works are, 1. The History of the French Academy. 2. Reflections on religious disputes, &c. in 4 vols. 12mo. 3. The History of Louis XIV. 4. Historical Letters and Miscellanies, in 3 vols. 12mo.

PELLITORY. In botany. See ACHILLEUS.

PELLITORY OF SPAIN. See ANTHEMIS and PYNETHRA.

PE'LLMELL. *ad.* (*pesle mesle*, Fr.) Confusedly; tumultuously; one among another; with confused violence (*Hudibras*).

PELLS. *s.* (*pellis*, Lat.) Clerk of the *pellis*, an officer belonging to the exchequer, who enters every teller's bill into a parchment roll called *pellis acceptorum*, the roll of receipts (*Bailey*).

PELLUCID. *a.* (*pellucidus*, Lat.) Clear; transparent; not opaque; not dark (*Newton*).

PELLUCIDITY. PELLUCIDNESS. *s.* (from *pellucid*.) Transparency; clearness; not opacity (*Locke. Keil*).

PELOPEA, or PELOPIA, a daughter of Thyestes, the brother of Atreus. She had a son by her father, who knew not that she was his own daughter. Some suppose that Thyestes purposely committed this incest, as the oracle had informed him that his wrongs should be avenged, and his brother destroyed by a son who should be born from him and his daughter. This proved too true. Pelopea afterwards married her uncle Atreus, who kindly received in his house his wife's illegitimate child, called Ægysthus, because preserved by goats, (*ægys*) when exposed in the mountains. Ægysthus became his uncle's murderer. (See ÆGYSTHUS.)

PELOPEIA, a festival observed by the people of Elis in honour of Pelops.

PELOPIDAS, a celebrated general of Thebes, son of Hippoclus, descended of an illustrious family, and remarkable for his immense possessions, which he bestowed with great liberality to the poor. He took great delight in the conversation of Epaminondas (see EPAMINONDAS), who despised riches, and from their friendship and intercourse the Thebans derived the most considerable advantages. No sooner had the interest of Sparta prevailed at Thebes, and the friends of liberty been banished from the city, than Pelopidas, who was in the number of the exiles, resolved to free his country from foreign slavery. Mean while Epaminondas, who had been left by the tyrants at Thebes, as a worthless philosopher, animated the youths of the city, and at last Pelopidas, and eleven of his associates, entered Thebes, massacred the

friends of the tyranny, and freed their country from foreign masters. After this successful enterprise, Pelopidas was placed at the head of the government, and so confident were the Thebans of his abilities, that they successfully re-elected him 13 times to fill the office of governor of Bœotia. Epaminondas shared with him the sovereign power, and it was to their valour and prudence that the Thebans were indebted for a celebrated victory at the battle of Leuctra. In a war which Thebes carried on against Alexander, tyrant of Phœæ, Pelopidas was appointed commander, and by his imprudence was taken prisoner, but Epaminondas restored him to liberty. The perfidy of Alexander irritated him, and he was killed bravely fighting in a celebrated battle in which his troops obtained the victory, B. C. 364 years. He received an honourable burial. Pelopidas is admired for his valour, as he never engaged an enemy without obtaining the advantage, and it has been justly observed, that with Pelopidas and Epaminondas the glory and the independence of the Thebans rose and set.

PELOPONNESIACUM BELLUM, Peloponnesian war, a celebrated war which continued for 27 years with various success, between the Athenians and the inhabitants of Peloponnesus, with their respective allies. It is the most famous and the most interesting of all the wars which happened between the inhabitants of Greece. The famous battle of Ægospotamos, where Lysander, the Lacedæmonian commander, attacked the Athenian fleet, and almost totally destroyed it, may be said to have been the finishing stroke of this long and obstinate contest. Of one hundred and eighty sail, only nine escaped, eight of which fled, under the command of Conon, to the island of Cyprus, and the other carried to Athens the melancholy news of the defeat. During four months, negociations were carried on with the Spartans, by the aristocratical part of the Athenians, and after a negociation of four months, it was at last agreed, that, to establish the peace, the fortifications of the Athenian harbours must be demolished, together with the long walls which joined them to the city; all their ships, except twelve, were to be surrendered to the enemy; they were to resign every pretension to their ancient dominions abroad; to recall from banishment all the members of the late aristocracy; to follow the Spartans in war, and in the time of peace, to frame their constitution according to the will and the prescriptions of their Peloponnesian conquerors. The terms were accepted, and the enemy entered the harbour, and took possession of the city. The walls and fortifications were instantly levelled with the ground. This memorable event happened about 404 years before the Christian era, and 30 tyrants were appointed by Lysander over the government of the city. To the correct and authentic writings of Thucydides and Xenophon we are principally indebted for the circumstantial detail of the events and revolutions of this war.

PELOPONNESUS, a celebrated peninsula, which comprehends the most southern parts of

Greece. It received this name from Pelops, who settled there, as the name indicates (*νηπότης*, the island of Pelops). It had been called before Argia, Pelasgia, and Argolis. Its present name is Morea. Peloponnesus was divided into six different provinces, Messenia, Laconia, Elis, Arcadia, Achaia propria, and Argolis, to which some add Sicyon. These provinces all bordered on the sea shore, except Arcadia. It was conquered some time after the Trojan war, by the Heraclidæ, who had been forcibly expelled from it. Its inhabitants rendered themselves illustrious, like the rest of the Greeks, by their genius, their fondness for the fine arts, the cultivation of learning, and the profession of arms. (See **PELOPONNESIACUM BELLUM**.) The Peloponnesus scarce extended 200 miles in length, and 140 in breadth. It was separated from Greece by the narrow isthmus of Corinth.

PELOPS, a celebrated prince, son of Tantalus, king of Phrygia. He was murdered by his father, who wished to try the divinity of the gods who had visited Phrygia, by placing on their table the limbs of his son. The gods perceived his cruelty, and they all refused to touch the meat, except Ceres, whom the recent loss of her daughter had rendered melancholy. She ate one of the shoulders of Pelops, and therefore when Jupiter restored him to life, he placed a shoulder of ivory instead of that which Ceres had devoured. This shoulder had an uncommon power, and it could heal by its very touch every complaint, and remove every disorder. Pindar, however, confutes the tradition of his ivory shoulder. Some time after, the kingdom of Tantalus was invaded by Tros, king of Troy, on pretence that he had carried away his son Ganymedes. Tantalus defeated, was obliged to fly with his son Pelops, and to seek a shelter in Greece. Pelops came to Pisa, where he became one of the suitors of Hippodamia, the daughter of king Cœnomaus, whom he conquered in a chariot race, and thereby gained his wife. (See **OENOMAUS**.) When he had established himself on the throne of Pisa, Hippodamia's possession, he extended his conquests over the neighbouring countries, and from him the peninsula, of which he was one of the monarchs, received the name of Peloponnesus. Pelops, after death, received divine honours. The children of Pelops by Hippodamia were Pitheus, Trœzen, Atreus, Thyestes, &c. besides some by concubines. The time of his death is unknown. Some suppose that the Palladium of the Trojans was made with the bones of Pelops. His descendants were called Pelopidæ. Some suppose that Pelops first instituted the Olympic games in honour of Jupiter, and to commemorate the victory which he had obtained over Cœnomaus.

PELORUM, or **PELORUS**, one of the three great promontories of Sicily, near Charybdis. It lies near the coast of Italy, and received its name, as some assert, from Pelorus, the pilot of the ship which carried Annibal away from Italy.

PELT. s. (from *pellis*, Latin.) 1. Skin;

hide (*Brown*). 2. The quarry of a hawk all torn (*Ainsworth*).

To PELT. *v. a.* (*pollern*, German. *Skinner*.) 1. To strike with something thrown (*Atterbury*). 2. To throw; to cast (*Dryden*).

PELTA, a small, light, manageable buckler, used by the ancients. It was worn by the Amazons. The pelta is said by some to have resembled an ivy leaf in form; by others it is compared to the leaf of an Indian fig-tree; and by Servius to the moon in her first quarter.

PELTA, in botany, a flat fructification on some lichens, resembling a round shield; whence its name.

PELTARIA, in botany, a genus of the class tetradynamia, order siliculosa. Silicle entire, somewhat orbicular, compressed, flat, not opening; one or three-seeded. Three species, herbs of the Cape.

PELTATE LEAF. A target-shaped leaf. Having the petiole inserted into the disk of the leaf, instead of the edge or base, as is most usual. As in *nymphæa*, *hernandia*, *colocasia*, *hydrocotyle*, *tropæolum*, *geranium peltatum*.—Applied also to a stigma, when it is round and flat, like a pelta.

PELTING. *a.* This word, in *Shakspeare*, signifies mean; paltry; pitiful.

PELTMONGER. *s.* (*pellio*, Latin; *pelt* and *monger*.) A dealer in raw hides.

PELVIS. (from *πελος*, a basin, because it is shaped like a basin used in former times.) The cavity below the belly. It is composed of four bones, viz. two OSSA INNOMINATA, the SACRUM, and OS COCCYGIS, which see. It contains the organs of generation, the bladder, and the rectum. See UTERUS, OVARIA, VAGINA, VESICA URINARIA, PROSTATE GLAND, RECTUM, &c.

PELVIS (Ligaments of). The articulation of the os sacrum with the last lumbar vertebra, and with the ossa innominata, is strengthened by means of a strong transverse ligament, which passes from the extremity and lower edge of the last lumbar vertebra, to the posterior and internal surface of the spine of the ilium. Other ligaments are extended posteriorly from the os sacrum to the os ilia on each side, and, from the direction of their fibres, may be called the lateral ligaments. Besides these, there are many shorter ligamentous fibres, which are seen stretching from the whole circumference of the articulating surfaces of these two bones. But the most remarkable ligaments of the pelvis are the two sacro-ischiatic ligaments, which are placed towards the posterior and inferior part of the pelvis. One of these may be called the greater, and the other the lesser sacro-ischiatic ligament. The first of these is attached to the posterior edge of the os sacrum, to the tuberosity of the ilium, and to the first of the three divisions of the os coccygis. Its other extremity is inserted into the inner surface of the tuberosity of the ischium. At its upper part it is of considerable breadth, after which it becomes narrower, but expands again before its insertion into the ischium, and, extending along the tuberosity of that bone to the

lower branch of the os pubis, where it terminates in a point, forms a kind of falx, one end of which is loose, while the other is fixed to the bone. The lesser sacro-ischiatic ligament is somewhat thicker than the former, and is placed obliquely before it. It extends from the transverse processes of the os sacrum, and the tuberosity of the spine of the ilium on each side, to the spine of the ischium. These two ligaments not only serve to strengthen the articulation of the ossa innominata with the os sacrum, but to support the weight of the viscera contained in the pelvis, the back and lower part of which is closed by these ligaments. The posterior and external surface of the greater ligament likewise serves for the attachment of some portions of the *gluteus maximus* and *gemini* muscles. The symphysis pubis is strengthened internally by a transverse ligament, some of the fibres of which are extended to the obturator ligament.

PELUSIUM, a town of Egypt, situate at the entrance of one of the mouths of the Nile, called from it Pelusian. It is about 20 stadia from the sea, and received the name from the lakes and marshes (πηλες) in its neighbourhood. It is now in ruins.

PEMBA, a town of Congo, capital of a province of the same name. Lon. 13. 25 E. Lat. 7. 30 S.

PEMBA, or PENDA, an island in the E. Indian Ocean, near the coast of Africa, about 100 miles in circumference, governed by a king, tributary to the Portuguese. Lon. 40. 0 E. Lat. 5. 50 S.

PEMBERTON (Dr. Henry), a learned physician and mathematician, was born at London, in 1694. After studying grammar at a school, and the higher classics under Mr. John Ward, afterwards professor of rhetoric at Gresham college, he went to Leyden to attend the lectures of the celebrated Boerhaave, to qualify himself for the profession of medicine. Here also, as well as in England, he constantly mixed with his professional studies those of the best mathematical authors. From Leyden he went to Paris, in order to perfect himself in the practice of anatomy, which he readily attained, being naturally dexterous in all manual operations. Having obtained his main object, he returned to London; enriched likewise with other branches of scientific knowledge, and a choice collection of mathematical books, both ancient and modern. After his return he assiduously attended St. Thomas's hospital, to acquire the London practice of medicine and surgery; though he seldom practised, owing to his delicate state of health. In 1719 he went again to Leyden to take his degree of M. D. where he was most kindly entertained by his friend Boerhaave. On his second return to London, he became more intimately acquainted with Dr. Mead, sir Isaac Newton, and other eminent men. And being an active man, he was highly useful to his friends; as, to Newton in preparing a new edition of his *Principia*, and in writing a popular account of his philosophical discoveries;

to Mr. Robins in bringing him forward, and writing some pieces printed in the 2d volume of that gentleman's collection of Tracts, &c. Being chosen professor of physic in Gresham college, he undertook to give a course of lectures on chemistry, which was improved every time he delivered it, and was published in 1771, by his friend Dr. James Wilson. After a long and laborious life spent in improving science, and assisting its cultivators, Dr. Pemberton died in 1771, at 77 years of age.

Besides the doctor's writings abovementioned, he wrote, 1. *Epistola ad Amicum de Cotesii inventis*; demonstrating Cotes's celebrated theorem, and shewing his other theorems by logarithms may be effected by the circle and hyperbola. 2. *Observations on Poetry*, especially the epic, occasioned by Glover's *Leonidas*. 3. A plan of a free state, with a king at its head (not published). 4. Account of the ancient ode, printed in the preface to West's *Pindar*. 5. A paper on the dispute about Fluxions, printed in the 2d vol. of Robins's Tracts. 6. On the Alteration of the Style and Calendar. 7. On reducing the Weights and Measures to one Standard. 8. A Dissertation on Eclipses. 9. On the *Loci Plani*, &c. His numerous communications to the Royal Society, in a variety of interesting subjects, extend from the 32d to the 62d vol. of the *Philos. Transactions*.

After his death many valuable pieces were found among his papers, viz. A short History of Trigonometry from Menelaus to Napier. A comment on an English translation of Newton's *Principia*. Demonstrations of Spherics and Spherical Projections, enough to compose a treatise on those subjects. A Dissertation on Archimedes's Screw. Improvements in Gauging. In a given latitude to find the point of the ecliptic which ascends the slowest. To find when the oblique ascension differs most from the arch to which it belongs. On the principles of Mercator's and middle latitude sailing. To find the heliacal rising of a star. To compute the moon's parallax. To determine the course of a comet in a parabolic orbit. Most of these are very neat and perspicuous.

PEMBRIDGE, a town in Herefordshire, with a market on Tuesday, seated on the Arrow, 12 miles N.W. of Hereford, and 145 W.N.W. of London. Lon. 2. 42 W. Lat. 52. 14 N.

PEMBROKE, the capital of Pembroke-shire, with a market on Saturday. It is seated on the innermost creek of Milford Haven, over which are two bridges, but the navigation to it is become injured by the rubbish of the limestone quarries near it. It is surrounded by a wall with three gates, has a castle on a rock, and two churches. It is governed by a mayor, sends one member to parliament, and is 10 miles S.E. of Haverfordwest, and 237 W. by N. of London. Lon. 4. 55 W. Lat. 51. 43 N.

PEMBROKE (Thomas), an English painter, and pupil of Larroon, whose manner he imi-

tated. He painted several pictures for the earl of Bath, and died in London about 1730, at the age of 28.

PEMBROKE (Mary Herbert), was wife of Henry earl of Pembroke, and sister of the celebrated sir Philip Sidney, who dedicated his *Arcadia* to her, which occasioned it to be called the countess of Pembroke's *Arcadia*. She translated a French tragedy called *Antionus*.

PEMBROKESHIRE, a county of South Wales, 37 miles long and 28 broad; surrounded on all sides by the sea, except on the E. where it is bounded by Carmarthenshire and Cardiganshire. It contains 335,600 acres; is divided into seven hundreds, and 145 parishes; has one city and seven market towns, and sends three members to parliament. The number of inhabitants in 1801 was 56,280. The rivers are inconsiderable. A great part of the county is plain, and tolerably fertile, consisting of rich meadow and arable land. The N.E. part alone is mountainous; which, however, yields good pasture for sheep and cattle.

PEMPHIGUS. (*πεμφιγος*, from *πνιμιξ*, a bubble). A fever attended by successive eruptions of vesicles about the size of almonds, which are filled with a yellowish serum, and in three or four days subside. The fever may be either synocha or typhus. It is a genus of disease in the class pyrexia and order exanthemata of Cullen. It is divided according to the size of the eruption into major and minor.

PEN. *s. (penna, Latin.)* 1. An instrument of writing (*Dryden*). 2. Feather (*Spenser*). 3. Wing (*Milton*). 4. (from *pennan*, Saxon.) A small enclosure; a coop (*L'Estrange*).

To PEN. *v. a. pret. and part. pass. pent.* (*pennan* and *pinban*, Saxon.) 1. To coop; to shut up; to incage; to imprison in a narrow place (*Bacon*). 2. (from the noun; pret. and part. pass. *penned*.) To write (*Digby*).

PEN, a little instrument, usually formed of a quill, serving to write with. Pens are also sometimes made of silver, brass, or iron.

PENS (Dutch), are made of quills that have passed through hot ashes, to take off the grosser fat and moisture, and render them more transparent and brittle.

PEN (Fountain), is a pen made of silver, brass, &c. contrived to contain a considerable quantity of ink, and let it flow out by gentle degrees, so as to supply the writer a long time without being under the necessity of taking fresh ink.

The fountain pen is composed of several pieces, as shewn at the bottom of pl. 129, where the middle piece F carries the pen, which is screwed into the inside of a little pipe, which again is soldered to another pipe of the same bigness as the lid G; in which lid is soldered a male screw, for screwing on the cover, as also for stopping a little hole at the place and hindering the ink from passing through it. At the other end of the piece F is a little pipe, on the outside of which the top-cover H may be screwed. In the cover there goes a port-crayon, which is to be screwed into the last-mentioned pipe, in order to

stop the end of the pipe, into which the ink is to be poured by a funnel. To use the pen, the cover G must be taken off, and the pen a little shaken, to make the ink run more freely.

There are, it is well known, some instruments used by practical mathematicians, which are called pens, and which are distinguished according to the use to which they are principally applied; as for example, the drawing pen, &c. an instrument too common to require particular description in this place.

PEN (Musical), a kind of fountain pen, contrived to deliver ink freely from five equidistant nibs at once, and thus formed for the purpose of ruling five equidistant lines, such as music is written on, at once.

PEN (Geometric), is an instrument in which, by a circular motion, a right line, a circle, an ellipse, and other mathematical figures, may be described. It was first invented and explained by John Baptist Suardi, in a work entitled *Nuovo Istromenta per la Descrizione di diverse Curve Antichi e Moderne*, &c. Several writers had observed the curves arising from the compound motion of two circles, one moving round the other; but Suardi first realized the principle, and first reduced it to practice. It has been lately introduced with success into the steam-engine by Watt and Bolton. The number of curves this instrument can describe is truly amazing; the author enumerates not less than 1273, which, he says, can be described by it in the simple form.

For a minute description of the geometrical pen, we must refer to Adams's *Geometrical and Graphical Essays*, and the 2d vol. of Prony's *Architecture Hydraulique*.

PENÆA, in botany, a genus of the class tetrandria, order monogynia. Calyx two-leaved; corol campanulate; style quadrangular; capsule square, four-celled, eight-seeded. Nine species; two of Ethiopia, the rest of the Cape: from one of the Æthiopian species is supposed to be obtained the concrete juice of the dispensatories, entitled *sarcocolla*; whence the species is denominated *P. sarcocolla*. It is probable that the other Æthiopian species, *P. mucronata*, affords a similar fluid. See *SARCOCOLLA*.

PENAL. *a.* (*penal*, Fr. from *pœna*, Lat.). 1. Denouncing punishment; enacting punishment (*South*). 2. Used for the purposes of punishment; vindictive (*Milton*).

PENALITY. *s.* (*penalité*, old Fr.) Liable-ness to punishment; condemnation to punishment (*Brown*).

PENALTY. *s.* (from *penalité*, old French). 1. Punishment; censure; judicial infliction (*Locke*). 2. Forfeiture upon non-performance (*Shakspeare*).

PENANCE. *s.* (*penence*, old French.) In-
 fliction either public or private, suffered as an expression of repentance for sin (*Bacon*).

PENATES, certain inferior deities among the Romans, who presided over houses and the domestic affairs of families. They were called Penates, because they were generally

placed in *penitissima adium parte*. The place where they stood was afterwards called *penetralia*, and they themselves received the name of *Penetrales*. According to some, the gods Penates were divided into four classes; the first comprehended all the celestial, the second the sea gods, the third the gods of hell, and the last all such heroes as had received divine honours. The statues of the Penates were generally made of wax, ivory, silver, or earth, according to the affluence of the worshipper, and the only offerings they received were wine, incense, fruits, and sometimes the sacrifice of lambs, sheep, goats, &c. Some have con-founded the Lares and the Penates, but they were different.

PENCE. *s.* The plural of *penny*.

PENCIL. *s.* (*penicillum*, Latin.) 1. A small brush of hair which painters dip in their colours (*Dryden*). 2. A black lead pen, with which, cut to a point, we write without ink (*Watts*). 3. Any instrument for writing without ink.

To PENCIL. *v. n.* (from the noun). To paint (*Shakspeare*).

PENCIL OF RAYS, in optics, is a double cone, or pyramid of rays, joined together at the base; one of which hath its vertex in some point of the object, and has the crystalline humour, or a glass for its base; and the other has its base on the same glass or crystalline, but its vertex in the point of convergence.

PENDANT, an ornament hanging at the ear, frequently consisting of diamonds, pearls, and other precious stones.

PENDANTS, in heraldry, parts hanging down from the label, to the number of three, four, five, or six at most, resembling the drops in the Doric frieze.

PENDANTS OF A SHIP, are those streamers or long colours which are split and divided into two parts ending in points, and hung at the head of masts, or at the yard-arm ends.

PENDENNIS, a castle in Cornwall, on a hill of the same name, on Falmouth bay. It was built by Henry VIII. for the security of the coast; and on the opposite side of the bay is another called *St. Maws*. It is a little to the S.E. of Falmouth, the harbour of which it defends.

PENDENCE. *s.* (from *pendeo*, Latin.) Slopeness; inclination (*Wotton*).

PENDENCY. *s.* (from *pendeo*, Latin.) Suspense; delay of decision (*Ayliffe*).

PENDENT. *a.* (*pendens*, Lat.) 1. Hang-
 ing (*Shakspeare*). 2. Jutting over (*Shaks.*). 3. Supported above ground (*Milton*).

PENDING. *a.* (*pendente lite*, Latin.) Depending; remaining yet undecided (*Ayl.*).

PENDULOSITY. PE'NDULOUSNESS. *s.* (from *pendulous*.) The state of hanging; sus-
 pension (*Brown*).

PE'NDULOUS. *a.* (*pendulus*, Lat.) Hang-
 ing; not supported below (*Ray*).

PENDULUM, in mechanics, any heavy body, so suspended as that it may swing back-
 wards and forwards, about some fixed point, by the force of gravity.

P E N D U L U M.

These alternate ascents and descents of the pendulum are called its oscillations, or vibrations; each complete oscillation being the descent from the highest point on one side, down to the lowest point of the arch, and so on up to the highest point on the other side. The point round which the pendulum moves, or vibrates, is called its centre of motion, or point of suspension: and a right line drawn through the centre of motion, parallel to the horizon, and perpendicular to the plane in which the pendulum moves, is called the axis of oscillation. There is also a certain point within every pendulum, into which, if all the matter that composes the pendulum were collected, or condensed as into a point, the times in which the vibrations would be performed would not be altered by such condensation; and this point is called centre of oscillation. The length of the pendulum is usually estimated by the distance of this point below the centre of motion, being always near the bottom of the pendulum; but in a cylinder or any other uniform prism or rod, it is at the distance of one third from the bottom, or two-thirds from and below the centre of motion.

The length of a pendulum, so measured to its centre of oscillation, that it will perform each vibration in a second of time, thence called the second's pendulum, has, in the latitude of London, been generally taken at $39\frac{1}{10}$ or $39\frac{1}{8}$ inches; but by some very ingenious and accurate experiments, the late celebrated Mr. George Graham found the true length to be $39\frac{133}{1000}$ inches, or $39\frac{1}{8}$ inches very nearly.

The length of the pendulum vibrating seconds at Paris was found by Varin, Des Hays, De Glos; and Godin, to be $440\frac{3}{4}$ lines; by Picard $440\frac{1}{2}$ lines; and by Mairan $440\frac{1}{3}$ lines.

Galileo was the first who made use of a heavy body annexed to a thread, and suspended by it, for measuring time, in his experiments and observations. But according to Sturmius, it was Riccioli who first observed the isochronism of pendulums, and made use of them in measuring time. After him Tycho, Langrene, Wendeline, Mer-senne, Kircher, and others, observed the same thing; though it is said, without any intimation of what had been done by Riccioli. But it was the celebrated Huygens who first demonstrated the principles and properties of pendulums, and probably the first who applied them to clocks. He demonstrated, that if the centre of motion was perfectly fixed and immovable, and all manner of friction, and resistance of the air, &c. removed, then a pendulum, once set in motion, would for ever continue to vibrate without any decrease of motion, and that all its vibrations would be perfectly isochronal, or performed in the same time. Hence the pendulum has universally been considered as the best chronometer or measurer of time. And as all pendulums of the same length perform their vibrations in the same time, without regard to their different weights, it has been suggested, by means of them, to establish an universal standard for all countries.

Pendulums are either simple or compound; and each of these may be considered either in theory, or as in practical mechanics among artisans.

A simple pendulum, in theory, consists of a single weight, as A, plate 132, fig. 1, considered as a point, and an inflexible right line AC, supposed void of gravity or weight, and suspended from a fixed point or centre, C, about which it moves.

A compound pendulum, in theory, is a pendulum consisting of several weights moveable about one common centre of motion, but connected together so as to retain the same distance both from one another, and from the centre about which they vibrate.

The doctrine and laws of pendulums.—1. A pendulum raised to B, through the arc of the circle AB, will fall and rise again, through an equal arc, to a point equally high, as D: and thence will fall to A, and again rise to B; and thus continue rising and falling perpetually. For it is the same thing whether the body falls down the inside of the curve BAD, by the force of gravity, or is retained in it by the action of the string: for they will both have the same effect; and it is otherwise known, from the oblique descents of bodies, that the body will descend and ascend along the curve in the manner above described.

Experience also confirms this theory, in any finite number of oscillations. But if they are supposed infinitely continued, a difference will arise. For the resistance of the air, and the friction and rigidity of the string about the centre C, will take off part of the force acquired in falling; whence it happens that it will not rise precisely to the same point from whence it fell.

Thus, the ascent continually diminishing the oscillation, this will be at last stopped, and the pendulum will hang at rest in its natural direction, which is perpendicular to the horizon.

Now, as to the real time of oscillation in a circular arc BAD; it is demonstrated by mathematicians, that if $p = 3.1416$, denote the circumference of a circle whose diameter is 1; $g = 16\frac{1}{2}$ feet, or 193 inches, the space a heavy body falls in the first second of time; and $r = CA$, the length of the pendulum; also $a = AE$, the height of the arch of vibration; then the time of each oscillation in the arc BAD, will be equal to $p\sqrt{\frac{r}{2g}}$

× the infinite series $1 + \frac{1^2a}{2^2d} + \frac{1^2.3^2a^2}{2^2.4^2d^2} + \frac{1^2.3^2.5^2a^3}{2^2.4^2.6^2d^3}$ &c. where $d = 2r$ is the diameter of the arc described, or twice the length of the pendulum.

And here, when the arc is a small one, as in the case of the vibrating pendulum of a clock, all the terms of this series after the $2d$ may be omitted, on account of their smallness; and then the time

of a whole vibration will be nearly equal to $p\sqrt{\frac{r}{2g}}$

× $(1 + \frac{a}{8r})$. So that the times of vibration of a pendulum in different small arcs of the same circle, are as $8r + a$; or 8 times the radius, added to the versed sine of the semi-arc.

And farther, if D denotes the number of degrees in the semi-arc AB, whose versed sine is a , then the quantity last mentioned, for the time of

a whole vibration, is changed to $p\sqrt{\frac{r}{2g}} \times (1 + \frac{D^2}{52524})$. And therefore the times of vibra-

tion in different small arcs are as $52524 + D^2$, or as the number 52524 added to the square of the number of degrees in the semi-arc AB.

2. Let CB, fig. 2, pl. 132, be a semicycloid, having its base EC parallel to the horizon, and its vertex B downwards; and let CD be the other

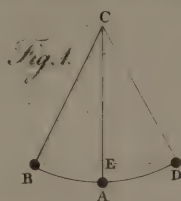


Fig. 1.

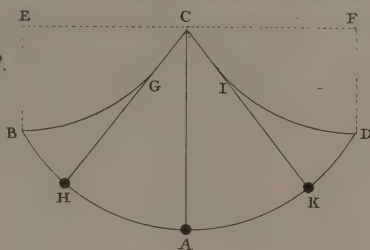


Fig. 2.

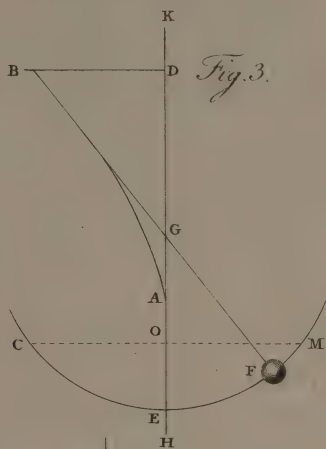


Fig. 3.

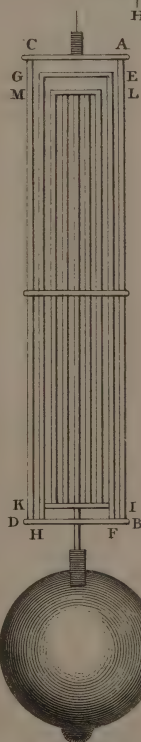


Fig. 4.



Fig. 5.

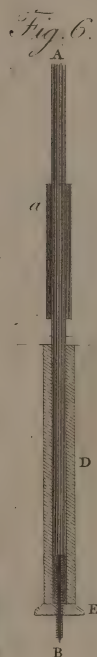
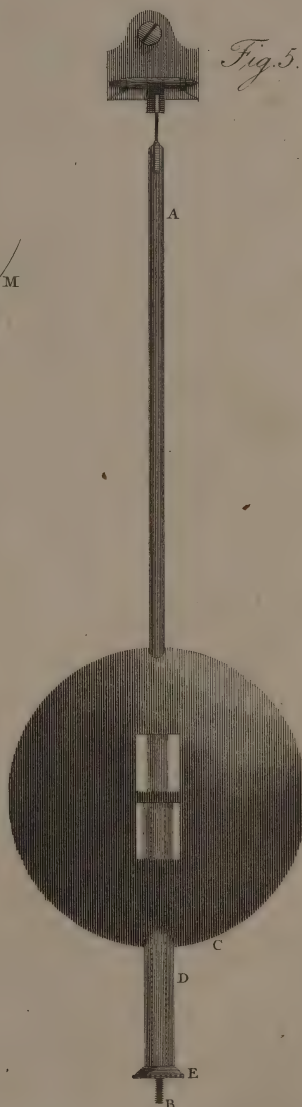


Fig. 6.



P E N D U L U M.

half of the cycloid, in a similar position to the former. Suppose a pendulum-string of the same length with the curve of each semicycloid BC or CD, having its end fixed in C, and the thread applied all the way close to the cycloidal curve BC, and consequently the body or pendulum-weight coinciding with the point B. If now the body is let go from B, it will descend by its own gravity, and in descending it will unwind the string from off the arch BC, as at the position CGH; and the ball G will describe a semicycloid BHA, equal and similar to BGC, when it has arrived at the lowest point A; after which it will continue its motion, and ascend by another equal and similar semicycloid AKD, to the same height D, as it fell from at B, the string now wrapping itself upon the other arch CID. From D it will descend again, and pass along the whole cycloid DAB, to the point B; and thus perform continual successive oscillations between B and D, in the curve of a cycloid; as it before oscillated in the curve of a circle, in the former case.

This contrivance to make the pendulum oscillate in the curve of a cycloid is the invention of the celebrated Huygens, to make the pendulum perform all its vibrations in equal times, whether the arch, or extent of the vibration, is great or small; which is not the case in a circle, where the larger arcs take a longer time to run through them than the smaller ones do, as is well known both from theory and practice.

The chief properties of the cycloidal pendulum then, as demonstrated by Huygens, are the following: 1st. That the time of an oscillation in all arcs, whether larger or smaller, is always the same quantity, viz. whether the body begins to descend from the point B, and describes the semi-arch BA; or that it begins at H, and describes the arch HA; or that it sets out from any other point; as it will still descend to the lowest point A in exactly the same time. And it is farther proved, that the time of a whole vibration through any double arc BAD or HAK, &c. is in proportion to the time in which a heavy body will freely fall, by the force of gravity, through a space equal to $\frac{1}{2}AC$, half the length of the pendulum, as the circumference of a circle is to its diameter. So that, if $g = 16\frac{1}{2}$ feet denotes the space a heavy body falls in the first second of time, $p = 3.1416$ the circumference of a circle whose diameter is 1, and $r = AC$ the length of the pendulum; then, because by the nature of descents by gravity,

$\sqrt{g} : \sqrt{\frac{1}{2}r} :: 1'' : \sqrt{\frac{r}{2g}}$, that is, the time in which a body will fall through $\frac{1}{2}r$, or half the length of the pendulum; therefore, by the above proportion, as $1 : p :: \sqrt{\frac{a}{2g}} : p \sqrt{\frac{r}{2g}}$, which is the time of an entire oscillation in the cycloid.

And this conclusion is abundantly confirmed by experience. For example: if we consider the time of a vibration as 1 second, to find the length of the pendulum that will so oscillate in 1 second;

this will give the equation $p \sqrt{\frac{r}{2g}} = 1$; which reduced, gives $r = \frac{2g}{p^2} = \frac{386}{3.1416^2}$ inches = 39.11,

or 39 $\frac{1}{4}$ inches, for the length of the second's pendulum; which the best experiments show to be about 39 $\frac{1}{4}$ inches.

3. Hence also, we have a method of determining, from the experimented length of a pendulum, the space a heavy body will fall perpendicularly

through in a given time; for, since $p \sqrt{\frac{r}{2g}} =$

1, therefore, by reduction, $g = \frac{1}{2} p^2 r$ is the space a body will fall through in the first second of time, when r denotes the length of the second's pendulum; and a constant experience shows that this length is nearly 39 $\frac{1}{4}$ inches, in the latitude of London, in this case g , or $\frac{1}{2} p^2 r$, becomes $\frac{1}{2} \times 3.1416^2 \times 39\frac{1}{4} = 193.07$ inches = 16 $\frac{1}{2}$ feet, very nearly, for the space a body will fall in the first second of time, in the latitude of London: a fact which has been abundantly confirmed by experiments made there. And in the same manner, Mr. Huygens found the same space fallen through at Paris to be 15 French feet.

The whole doctrine of pendulums oscillating between two semicycloids, both in theory and practice, was delivered by that author, in his *Horologium Oscillatorium, sive Demonstrationes de Motu Pendulorum*. And every thing that regards the motion of pendulums has since been demonstrated in different ways, and particularly by Newton, who has given an admirable theory on the subject, in his *Principia*, where he has extended to epicycloids the properties demonstrated by Huygens of the cycloids.

4. As the cycloid may be considered as coinciding in A, with any small arc of a circle described from the centre C, passing through A, where it is known the two curves have the same radius and curvature; therefore the time in the small arc of such a circle, will be nearly equal to the time in the cycloid; so that the times in very small circular arcs are equal, because these small arcs may be considered as portions of the cycloid, as well as of the circle. And this is one great reason why the pendulums of clocks are made to oscillate in as small arcs as possible, viz. that their oscillations may be the nearer to a constant equality.

This may also be deduced from a comparison of the times of vibration in the circle, and in the cycloid, as laid down in the foregoing articles. It has there been shown, that the times of vibration in the circle and cycloid are thus, viz. time in the

circle nearly $p \sqrt{\frac{r}{2g}} \times (1 + \frac{a}{8r})$, time in the

cycloidal arc $p \sqrt{\frac{r}{2g}}$; where it is evident that

the former always exceeds the latter in the ratio

of $1 + \frac{a}{8r}$ to 1; but this ratio always approaches

nearer to an equality, as the arc, or as its versed sine a , is smaller; till at length, when it is very

small, the term $\frac{a}{8r}$ may be omitted, and then the

times of vibration become both the same quantity,

viz. $p \sqrt{\frac{r}{2g}}$.

Farther, by the same comparison, it appears, that the time lost in each second, or in each vibration of the seconds pendulum, by vibrating

in a circle, instead of a cycloid, is $\frac{a}{8r}$, or

$\frac{D^2}{52524}$; and consequently the time lost in a

whole day of 24 hours, is $\frac{1}{2} D^2$ nearly. In like manner, the seconds lost per day by vibrating in the arc of Δ degrees, is $\frac{1}{2} \Delta^2$. Therefore, if the pendulum keeps true time in one of these arcs, the seconds lost or gained per day, by vibrating

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in the other, will be $\frac{1}{4}(D^2 - \Delta^2)$. So, for example, if a pendulum measures true time in an arc of 3 degrees, on each side of the lowest point, it will lose $11\frac{1}{2}$ seconds a day by vibrating 4 degrees; and $26\frac{1}{2}$ seconds a day by vibrating 5 degrees; and so on.

5. The action of gravity is less in those parts of the earth where the oscillations of the same pendulum are slower, and greater where these are swifter; for the time of oscillation is reciprocally proportional to $\sqrt{g}$. And it being found by experiment, that the oscillations of the same pendulum are slower near the equator, than in places farther from it; it follows that the force of gravity is less there; and consequently the parts about the equator are higher or farther from the centre, than the other parts; and the shape of the earth is not a true sphere, but somewhat like an oblate spheroid, flattened at the poles, and raised gradually towards the equator. And hence also the times of the vibration of the same pendulum, in different latitudes, afford a method of determining the true figure of the earth, and the proportion between its axis and the equatorial diameter.

Thus, M. Richer found by an experiment made in the island of Cayenne, about 4 degrees from the equator, that a pendulum 3 feet $8\frac{1}{2}$ lines long, which at Paris vibrated seconds, required to be shortened a line and a quarter to make it vibrate seconds. And many other observations have confirmed the same principle. See Newton's Principia, lib. iii. prop. 20. By comparing the different observations of the French astronomers, Newton apprehends that 2 lines may be considered as the length a second's pendulum ought to be decreased at the equator.

From some observations made by Mr. Campbell, in 1731, in Black-river, in Jamaica, 18° north latitude, it is collected, that if the length of a simple pendulum that swings seconds in London is 39.126 English inches, the length of one at the equator would be 39.02, and at the poles 39.197.

And hence Mr. Emerson has computed the following table, showing the length of a pendulum that swings seconds at every 5th degree of latitude.

Degrees of Latitude.	Length of Pendulum.	Degrees of Latitude.	Length of Pendulum.	Degrees of Latitude.	Length of Pendulum.
	Inches.		Inches.		Inches.
0	39.027	35	39.084	65	39.168
5	39.029	40	39.097	70	39.177
10	39.032	45	39.111	75	39.185
15	39.036	50	39.126	80	39.191
20	39.044	55	39.142	85	39.195
25	39.057	60	39.158	90	39.197
30	39.070				

6. If two pendulums vibrate in similar arcs, the times of vibration are in the sub-duplicate ratio of their lengths. And the lengths of pendulums vibrating in similar arcs, are in the duplicate ratio of the times of a vibration directly; or in the reciprocal duplicate ratio of the number of oscillations made in any one and the same time.

For, the time of vibration t being as $p \sqrt{\frac{r}{2g}}$ where p and g are constant or given, therefore t is as $\sqrt{r}$, and r as t^2 . Hence therefore the length

of a half-second pendulum will be $\frac{1}{4}r$, or $\frac{39\frac{1}{2}}{4} = 9.781$ inches; and the length of the quarter-second pendulum will be $\frac{1}{16}r = \frac{39\frac{1}{2}}{16} = 2.445$ inches; and so of others.

7. The foregoing laws, &c. of the motion of pendulums, cannot strictly hold good, unless the thread that sustains the ball is void of weight, and the gravity of the whole ball is collected into a point. In practice, therefore, a very fine thread, and a small ball, but of a very heavy matter, are to be used. But a thick thread, and a bulky ball, disturb the motion very much; for in that case, the simple pendulum becomes a compound one; it being much the same thing, as if several weights were applied to the same inflexible rod in several places.

8. Mr. Krafft, in the new Petersburg Memoirs, vols. 6 and 7, has given the result of many experiments upon pendulums, made in different parts of Russia, with deductions from them, from whence he derives this theorem: if x is the length of a pendulum that swings seconds in any given latitude l , and in a temperature of 10 degrees of Reaumur's thermometer, then will the length of that pendulum, for that latitude, be thus expressed, viz.

$x = (439.178 + 2.321 + \sin 2l)$ lines of a French foot. And this expression agrees very nearly, not only with all the experiments made on the pendulum in Russia, but also with those of Mr. Graham, and those of Mr. Lyons in $79^\circ 50'$ north latitude, where he found its length to be 441.38 lines, and as well as the recent experiments and computations of the French philosophers.

Rule. To find the length of a pendulum to make any number of vibrations, and *vice versa*. Call the pendulum making 60 vibrations the standard length; then say, as the square of the given number of vibrations is to the square of 60; so is the length of the standard to the length sought. If the length of the pendulum be given, and the number of vibrations it makes in a minute be required; say, as the given length is to the standard length, so is the square of 60, its vibrations in a minute, to the square of the number required. The square root of which will be the number of vibrations made in a minute.

From this rule it is easy to find that a pendulum 52.02982 inches long, will vibrate as often in a minute, as it is inches in length.

One that is 3.994805 inches long, will vibrate as often in a second, as it is inches in length.

Angular pendulum, is formed of two pieces or legs like a sector, and is suspended by the angular point. This pendulum was invented with a view to diminish the length of the common pendulum, but at the same time to preserve or even increase the time of vibration. In this pendulum, the time of vibration depends on the length of the legs, and on the angle contained between them conjointly, the duration of the time of vibration increasing with the angle. Hence a pendulum of this construction may be made to oscillate in any given time. At the lower extremity of each leg of the pendulum is a ball or bob as usual. It may be easily shown, that in this kind of pendulum, the squares of the times of vibration are as the secants of half the angle contained by the legs: hence, if a pendulum of this construction vibrates half seconds when its legs are close, it will vibrate whole seconds when the legs are opened, so as to contain an angle equal to $151^\circ 2\frac{1}{2}'$.

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If the two cylindrical legs of an angular pendulum are each 15 inches, and they make an angle of $150^{\circ} 23'$, the time of vibration will be 1 second; if the angle be increased to $178^{\circ} 49\frac{1}{2}'$, while the legs continue of the same length, the time of vibration would be 5 seconds. (Gregory's *Mechanics*, vol. i. p. 269.)

If an isosceles right angled triangle be suspended at its vertex, the centre of oscillation will be in the middle of its base; and if a right angled cone be suspended at its vertex, the centre of oscillation will be in the centre of the base: in either case, therefore, the time of vibration will be the same as that of a simple pendulum whose length is equal to the altitude of the triangle or of the cone. Other pendulums whose lengths shall be equal to the distance between the point of suspension and the centre of oscillation, may be readily found from the known expressions for the centre of oscillation. Thus, in a parabola vibrating in its own plane and suspended at its vertex, the distance of the centre of oscillation from that vertex is $\frac{1}{2}$ axis + $\frac{1}{4}$ parameter: and when this expression is equal to the axis, the base of the parabola will be to its axis, as 1:85164 to 1.

The conical or circular pendulum, is so called from the figure described by the string or ball of the pendulum. This pendulum was invented by Mr. Huygens, and is also claimed by Dr. Hook.

In order to understand the principles of this pendulum, it will be necessary to premise the following lemma, viz. The times of all the circular revolutions of a heavy globular body, revolving within an inverted hollow paraboloid, will be equal, whatever be the radii of the circles described by that body.

In order, therefore, to construct the pendulum so that its ball may always describe its revolutions in a paraboloid surface, it will be necessary that the rod of the pendulum be flexible, and that it be suspended in such a manner as to form the evolute of the given parabola. Hence, let KH (fig. 3, pl. 132) be an axis perpendicular to the horizon, having a pinion at K moved by the last wheel in the train of the clock; and a hardened steel point at H moving in an agate pivot, to render the motion as free as possible. Now, let it be required that the pendulum shall perform each revolution in a second, then the paraboloid surface it moves in must be such whose *latus rectum* is double the length of the common half-second pendulum. Let O be the focus of the parabola MEC, and MC the *latus rectum*; and make $AE = MO = \frac{1}{2}MC$ = the length of a common half-second pendulum. At the point A of the verge, let a thin plate AB be fixed at one end, and at the other end B let it be fastened to a bar or arm BD perpendicular to DH, and to which it is fixed at the point D. The figure of the plate AB is that of the evolute of the given parabola MEC.

The equation of this evolute, being also that of the semicubical parabola, is $\frac{27}{16} p x^2 = y^3$.—Let

$\frac{27}{16} p = P$; then $P x^2 = y^3$, and in the focus $P = 2 y$.

In this case $2 x^2 = y^2 = \frac{1}{4} P^2$: hence $x^2 = \frac{1}{8} P^2$, and x

$= P \sqrt{\frac{1}{8}} = \frac{27}{16} p \sqrt{\frac{1}{8}}$ = the distance of the focus from the vertex A. By assuming the value of x , the ordinates of the curve may be found; and hence it may be easily drawn.

The string of the pendulum must be of such a

length, that when one end is fixed at B, it may lie over the plate AB, and then hang perpendicular from it, so that the centre of the bob may be at E when at rest. Now the verge KH being put into motion, the ball of the pendulum will begin to gyrate, and thereby conceive a centrifugal force which will carry it out from the axis to some point F, where it will circulate seconds or half-seconds, according as the line AE is 9.8 inches, or $2\frac{1}{4}$ inches, and AB answerable to it.

One advantage possessed by a clock having a pendulum of this construction is, that the second hand moves in a regular and uniform manner, without being subject to those jerks or starts as in common clocks; and the pendulum is entirely silent.

The conical pendulum has been very ingeniously employed as a regulator by Messrs. Boulton and Watt, in their steam engines. See STEAM ENGINE.

The greatest inconvenience attending the pendulum is, that it is constantly liable to an alteration of its length, from the effects of heat and cold, which very sensibly expand and contract all metalline bodies. See HEAT, PYROMETER, &c.

To remedy this inconvenience, the common method is by applying the bob of the pendulum with a screw; so that it may be at any time made longer or shorter, according as the bob is screwed downwards or upwards, and thereby the time of its vibrations kept always the same. Again, if a glass or metalline tube, uniform throughout, filled with quicksilver, and 58.8 inches long, were applied to a clock, it would vibrate seconds for $39.2 = \frac{2}{3}$ of 58.8, and such a pendulum admits of a two-fold expansion and contraction, viz. one of the metal and the other of the mercury, and these will be at the same time contrary, and therefore will correct each other. For by what we have shown, the metal will extend in length with heat, and so the pendulum will vibrate slower on that account. The mercury also will expand with heat, and since by this expansion it must extend the length of the column upward, and consequently raise the centre of oscillation; so that by this means its distance from the point of suspension will be shortened, and therefore the pendulum on this account will vibrate quicker; wherefore, if the circumstances of the tube and mercury are skillfully adjusted, the time of the clock might, by this means, for a long course of time, continue the same, without any sensible gain or loss. This was the invention of Mr. Graham, in the year 1721, who made a clock of this sort, and compared it with one of the best of the common sort for three years together, and found the errors of the former but about one-eighth part of the latter.

Mr. Graham also made a pendulum consisting of three bars, one of steel between two of brass, and the steel bar acted upon a lever, so as to raise the pendulum, when lengthened by heat, and to let it down, when shortened by cold; but he found this clock liable to sudden starts and jerks in this motion.

The ingenious Mr. Ellicott, in the Transactions of the Royal Society, describes a pendulum of his invention, composed of brass and iron, with the method of applying it, so as to avoid the many jerks to which the machine might be liable.

But besides the irregularities arising from heat and cold, pendulum clocks are liable to others from friction and foulness; to obviate which, Mr. Harrison has several excellent contrivances,

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whereby his clocks are almost entirely free from friction, and never need to be cleaned.

The gridiron pendulum is a contrivance for the same purpose. Instead of one rod, this pendulum is composed of any convenient odd number of rods, as five, seven, or nine; being so connected, that the effect of one set of them counteracts that of the other set; and therefore, if they are properly adjusted to each other, the centres of suspension and oscillation will always be equidistant. Fig. 4 represents a gridiron pendulum composed of nine rods, steel and brass alternately. The two outer rods, AB, CD, which are of steel, are fastened to the cross pieces AC, BD, by means of pins. The next two rods, EF, GH, are of brass, and are fastened to the lower bar BD, and to the second upper bar EG. The two following rods are of steel, and are fastened to the cross bars EG and IK. The two rods adjacent to the central rod being of brass, are fastened to the cross pieces IK and LM; and the central rod, to which the ball of the pendulum is attached, is suspended from the cross piece LM, and passes freely through a perforation in each of the cross bars IK, BD. From this disposition of the rods, it is evident that, by the expansion of the extreme rods, the cross piece BD, and the two rods attached to it, will descend: but since these rods are expanded by the same heat, the cross piece EG will consequently be raised, and therefore also the two next rods; but because these rods are also expanded, the cross bar IK will descend; and by the expansion of the two next rods, the piece LM will be raised a quantity sufficient to counteract the expansion of the central rod. Whence it is obvious, that the effect of the steel rods is to increase the length of the pendulum in hot weather, and to diminish it in cold weather, and that the brass rods have a contrary effect upon the pendulum. The effect of the brass rods must, however, be equivalent not only to that of the steel rods, but also to the part above the frame and spring, which connects it with the cock, and to that part between the lower part of the frame and the centre of the ball.

Another excellent contrivance for the same purpose is described in a French author on clock-making. It was used in the north of England by an ingenious artist about fifty years ago. This invention is as follows: a bar of the same metal with the rod of the pendulum, and of the same dimensions, is placed against the back-part of the clock-case: from the top of this a part projects, to which the upper part of the pendulum is connected by two fine pliable chains or silken strings, which just below pass between two plates of brass, whose lower edges will always terminate the length of the pendulum at the upper end. These plates are supported on a pedestal fixed to the back of the case. The bar rests upon an immovable base at the lower part of the case; and is inserted into a groove, by which means it is always retained in the same position. From this construction, it is evident that the extension or contraction of this bar, and of the rod of the pendulum, will be equal, and in contrary directions. For suppose the rod of the pendulum to be expanded any given quantity by heat; then, as the lower end of the bar rests upon a fixed point, the bar will be expanded upwards, and raise the upper end of the pendulum just as much as its length was increased; and hence its length below the plates will be the same as before.

It has been supposed by several, that the tubu-

lar pendulum (which is also a modification of Harrison's compensation) is but a very recent invention: but the writer of the article *Clock* in the *British Encyclopædia* met with one by accident which was made upwards of thirty years ago; and thinks it but justice, both to the public and the ingenious artist who directed its construction, to oppose this opinion. This pendulum is in possession of Mr. Patoureaux, watch and clock-maker, 15, Wardour-street. It was made by Mr. William Brown, a clock-maker well known to the trade, who has been dead upwards of five years, and who formerly resided near the Seven Dials. His brother, a jeweller, residing in 15, Coventry-court, Haymarket, was his executor, and sold the pendulum to Mr. Barrett, clock-maker, of Compton-street, some years ago, from whence Mr. Patoureaux bought it. Mr. Brown, the jeweller, informed the writer that this pendulum had been made by his brother upwards of thirty years ago, just after he had served his time to Mr. Chandler, then of King-street, Seven Dials (whom he afterwards succeeded in his business); and that it was made by direction of Mr. Chandler, who, as far as he knew, was the inventor of it: and in corroboration of this assertion, Mr. Hampson, working clock-maker, 22, Greek-street, Soho, declares, that he made several pendulums of the same construction for Mr. Brown, upwards of seven years ago. This tubular pendulum, which at present we must attribute to the ingenuity of Mr. Chandler, is composed of two tubes and a rod of iron, and two tubes of brass. The iron rod is about a quarter of an inch in diameter, and is suspended by a spring in the common manner: it is inclosed by the first brass tube, to which it is connected at bottom: an iron tube, supported by the top of the brass tube, then descends a little below it, and supports by its lower extremity the second brass tube, which rises a little above the former tubes, and from the top of it the second iron tube descends below all about two inches into the substance of the pendulum bob, which is very large and heavy: the bottom of this last tube contains a nut, into which a screw (having a milled head beneath that sustains the bob), passes from below, and raises or lowers the bob, as required for the adjustment of the rate of going of the clock. We may date the invention of the tubular pendulum, from the foregoing information, about the year 1775, though it may yet be found to be of a still earlier period. The foreman of Mr. Villaumy, clock-maker to the Prince of Wales, Pall-mall, declares, that he remembers a tubular pendulum to have been made by Mr. Finney, a well-known clock-maker of Liverpool, upwards of forty years ago, and that it is now in the possession of Mr. De Membry, of Richmond; but space will not permit the farther investigation of this point at present.

The modification of the longitudinal compensation made public by Mr. Troughton, mathematical instrument-maker, differs from Chandler's tubular pendulum, in having but two tubes of brass, which afford the ascending compensations, while the descending ones are performed by five wires of steel. The order of brass and steel is the same as in Chandler's pendulum; but all the steel wires pass downwards through the internal brass tube. The last pair of wires connect the whole with the bob by a short cylindrical piece of brass, to which the bob is suspended by its centre.

Mr. Troughton made this pendulum in July,

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1804, and published the first account of it in December same year, in Nicholson's Philosophical Journal: we believe he knew nothing of the priority of Chandler's tubular pendulum to his, and that in thinking and declaring himself the first inventor of tubular pendulums, he only fell into an error common to many other ingenious men on similar occasions; and this error is the more excusable, as at the time Chandler made his pendulum there were no periodical works in existence which professedly recorded the improvements of arts and manufactures, and artists were in general more careful to conceal their discoveries than to acquire reputation by making them public.

Before concluding the enumeration of various sorts of pendulums, one suggested by Mr. Troughton should be noticed, which seems worthy of trial. He proposes that its rod should be made of baked potter's earth, of the same composition as Wedgwood's thermometer, and furnished with a metallic cap, by which it should be sustained by the knife-edge suspension, which the celebrated Berthoud affirms has less friction than the spring suspension.

The chief advantages which tubular pendulums have over those of the gridiron construction are, that they admit of being much lighter above the bob with equal strength; that they experience less resistance from the air in their vibrations; and that they are less liable to those shakes and irregular motions in their expansions which the others experience: on the other hand, as the outside tube alone in them comes in contact with the air through which it passes in its vibrations, the inner tubes can receive much less of its influence as to temperature, which arises from this motion, and which Cummings has shown to be of considerable consequence. In Troughton's pendulum the great difference of the masses of matter between the ascending and descending parts must be another source of error, as the small wires of which the latter consist indubitably will much sooner experience the influence of a change of temperature in the air than the more bulky substance of the tubes. In this latter respect Chandler's tubular pendulum seems superior to Troughton's, all its parts being much more nearly of the same magnitude.

The last compensation pendulum we shall mention is that of Mr. Adam Reid, a very ingenious mechanist at Woolwich. It is made of steel and zinc, the proportions of the respective parts being adjusted according to their several powers of expansion. The following are Mr. Reid's directions. Procure a rod of forged blister-steel 52.7 inches long, .27 diameter, heat it to a white heat, which will open the pores of the steel, and give it the smallest expansive power that steel of that texture is possessed of; when cold, straighten it with a mallet of wood on a wooden block, that no part may be condensed partially, which would be the case if a hammer and anvil were used. Then cast a solid rod of zinc 12.5 inches long, .68 diameter, with the lowest heat that will fuse it; pour it into a metal mould: this will give it the greatest density, consequently the greatest expansion that zinc is possessed of. Then bore a hole through the centre of it longitudinally, that it may move freely at the steel rod, which has a nut and screw at the bottom end to regulate the clock to mean time; the bob, as shown in fig. 5, plate 132, rests on the upper end of the cylinder of zinc, and will continue in the same place, what-

ever expansion or contraction takes place, if the adjustment be correct.

If platina were used instead of steel, and steel instead of zinc, a pendulum might be made equally good, and more compact; but not at so small an expence. The dimensions above specified are for a second's pendulum in its finished state.

To give all possible perspicuity to this description, figs. 5 and 6, pl. 132, are added: where AB represents the steel rod extending through the whole. C the bob, supported upon the compensating cylinder of zinc D, which surrounds the rod AB, and rests upon the nut E of a screw tapped upon the end of the steel rod, to bring it to exact time; as this expands downwards by heat, the zinc expands upwards the same quantity; so that the bob always remains at the same distance from the point of suspension. Fig. 6 is a section to show more clearly the thickness of the zinc tube D, and the form of the steel rod at *a*, where it passes through the bob, it being there of the transverse shape shown at L, that the rod or the bob may not turn round when the nut E is turned to adjust it to time.

Fifteen guineas were voted to Mr. Reid by the society, as a compliment for this truly ingenious invention.

PENDULUM-CLOCK is a clock having its motion regulated by the vibration of a pendulum.

It is controverted between Galileo and Huygens, which of the two first applied the pendulum to a clock.

After Huygens had discovered that the vibration made in arcs of a cycloid, however unequal they might be in extent, were all equal in time; he soon perceived, that a pendulum applied to a clock, so as to make it describe arcs of a cycloid, would rectify the otherwise unavoidable irregularities of the motion of the clock; since, though the several causes of those irregularities should occasion the pendulum to make greater or smaller vibrations, yet, by virtue of the cycloid, it would still make them perfectly equal in point of time; and the motion of the clock governed by it would therefore be preserved perfectly equable. But the difficulty was, how to make the pendulum describe arcs of a cycloid; for naturally the pendulum, being tied to a fixed point, can only describe circular arcs about it.

Here Mr. Huygens contrived to fix the iron rod or wire, which bears the ball or weight at the top, to a silken thread, placed between two cycloidal cheeks, or two little arcs of a cycloid, made of metal. Hence the motion of vibration, applying successively from one of those arcs to the other, the thread, which is extremely flexible, easily assumes the figure of them, and by that means causes the ball or weight at the bottom to describe a just cycloidal arc.

This is doubtless an ingenious invention, more especially as it gave rise to the whole doctrine of involute and evolute curves, with the radius and degree of curvature, &c.

But it is not of any essential service in the practice of clock-making; for the isochronism of vibrations in cycloidal arcs is demonstrated upon the supposition that the whole mass of the pendulum is concentrated in a point: a supposition which cannot actually take place in any vibrating body. Many other reasons have induced the artists to abandon the use of the cycloidal pendulum. The principal are, the difficulty with which the metallic cheeks are bent into the true cycloidal

form; the improbability of their long retaining it, supposing it once given; and the changes of which the pendulum is susceptible in consequence of the expansion and contraction by heat and cold. These sources of error are such as the peculiar property of the cycloid cannot obviate: and as the variations from isochronism in very small circular arcs is extremely trifling, the cycloidal pendulum is now wholly disused in practice (*Gregory's Mechanics*, vol. i. p. 230.)

PENELOPE, in fabulous history, a celebrated princess of Greece, daughter of Icarius, of Sparta, and wife of Ulysses, king of Ithaca. She soon after became mother of Telemachus, and was obliged to part with great reluctance from her husband, whom the Greeks obliged to go to the Trojan war. (Vid. **PALAMÉDES**.) The continuation of the war rendered her melancholy; but when Ulysses did not return, like the other princes, her fears were increased, and she was soon beset by a number of suitors, who wished her to believe that her husband was shipwrecked. She received their addresses with disdain; she yet flattered them with hopes, and declared that she would make choice of one of them, as soon as she had finished a piece of tapestry then in hand; but she baffled their eager expectations by undoing in the night what she had done in the day-time. This artifice of Penelope has given rise to the proverb of *Penelope's web*, which is applied to whatever labour can never be ended. The return of Ulysses, after an absence of twenty years, however, delivered her from her dangerous suitors. (*Homer, Ovid, &c.*) Penelope is described by Homer as a model of female virtue and chastity; but some more modern writers dispute her claims to modesty and continence, representing her as the most debauched and voluptuous of her sex.

PENELOPE, in zoology, a genus of the class aves, order gallinæ. Bill naked at the base; head covered with feathers; chin naked; tail with twelve feathers; legs spurless. Four species; in Linnæus six; two of which last, however, do not properly belong to this genus.

1. *P. cristata* Guan. Head with an erect crest; temples violet; bill black; irids orange; nostrils reaching from the middle of the bill to the front; orbits violet; caruncle on the chin compressed, red, covered with a few hairs; crest oblong; body black-green; back brown; neck, breast, and belly spotted with white; legs red. Inhabits Brazil and Guiana; two and a half feet long. They are often tamed; and make a noise not unlike the sound *jacu*: flesh accounted good.

2. *P. cumanensis*. Yacou. Blackish; crest and first quill-feathers white; irids brownish; orbits and chin naked, blueish; body beneath speckled with white; tail long, even; legs red. Inhabits Cayenne and Guiana; size of a hen-turkey; erects the crest and spreads its tail; builds on the ground, or in low trees. At Cayenne it is tamed, becomes familiar, and will mix with other poultry,

3. *P. pipile*. Piping curassow, Caruncle

on the chin blue; belly black; back brown, spotted with black; wing-coverts and first quill-feathers white; legs red. Inhabits with the last: voice weak, piping.

4. *P. maril*, Marail. Greenish-black; naked orbits, and legs red; throat nakedish, speckled with white; bill and irids blackish; head crested. The crest erected when the bird is irritated; wings short; tail long, even, often erected and expanded. Inhabits in flocks in the woods of Guiana; roosts in trees whose food it feeds upon; emits a disagreeably harsh cry.

PENETRABILITY. *s.* (from *penetrable*.) Susceptibility of impression from another body (*Cheyne*).

PENETRABLE. *a.* (*penetrable*, Fr. *penetrabilis*, Latin.) 1. Such as may be pierced; such as may admit the entrance of another body (*Dryden*). 2. Susceptive of moral or intellectual impression (*Shakspeare*).

PENETRAIL. *s.* (*penetralia*, Latin.) Interior parts: not in use (*Harvey*).

PENETRANCY. *s.* (from *penetrant*.) Power of entering or piercing (*Ray*).

PENETRANT. *a.* (*penetrant*, French.) Having the power to pierce or enter; sharp; subtle (*Boyle*).

To PENETRATE. *v. a.* (*penetrer*, Fr.)

1. To pierce; to enter beyond the surface; to make way into a body (*Arbutnot*). 2. To affect the mind. 3. To teach the meaning (*Ray*).

To PENETRATE. *v. n.* 1. To make way (*Pope*). 2. To make way by the mind (*Locke*).

PENETRATION. *s.* (*penetration*, Fr.)

1. The act of entering into any body (*Milton*). 2. Mental entrance into any thing abstruse. 3. Acuteness; sagacity (*Watts*).

PENETRATIVE. *a.* (from *penetrate*.)

1. Piercing; sharp; subtle (*Wotton*). 2. Acute; sagacious; discerning (*Swift*). 3. Having the power to impress the mind (*Shakspeare*).

PENETRATIVENESS. *s.* (from *penetrative*.) The quality of being penetrative.

PENGUIN, in ornithology. See **ALCA** and **APTENODYTES**.

PENGUIN, in botany. See **BROMELIA**.

PENICILLIFORM APPENDIX. In botany, an appendix to the keel of the corol in some sorts of polygala; in shape of a painter's pencil.

PENICILLIFORM STIGMA. A pencil-shaped stigma; as in milium.

PENICILLUM, in anatomy. See **ACINIBILIOSI**.

PENINSULA. *s.* (Latin, *pene insula*.) A piece of land almost surrounded by the sea.

PENINSULATED. *a.* (from *peninsula*.) Almost surrounded by water.

PENIS. (*penis*, a *pendendo*, from its hanging down.) Membrum virile. The cylindrical part that hangs down under the mons veneris before the scrotum of males. It is divided by anatomists into the root, body, and

head, called the glans penis. It is composed of common integuments, two corpora cavernosa, and one corpus spongiosum, which surrounds a canal, the urethra, that proceeds from the bladder to the apex of the penis, where it opens by the meatus urinarius. (See URETHRA.) The fold of the skin that covers the glans penis is termed the prepuce. The arteries of the penis are from the hypogastric and ischiatic. The vein of the penis, vena magna ipsius penis, empties itself in the hypogastric vein. The absorbents of this organ are very numerous, and run under the common integuments to the inguinal glands: absorbents also are found in great plenty in the urethra. The glands of the penis are, Cowper's glands, the prostate, muciparous, and odoriferous glands. The nerves of the penis are branches of the sacral and ischiatic.

PENIS ERECTOR. In myology. See ERECTOR PENIS.

PENISCOLA, a town of Spain, in Valencia, seated on a high point of land, surrounded on three sides by the sea, and of difficult access by land. It is 30 miles S. by W. of Tortosa, and 80 N.N.E. of Valencia. Lon. 0. 24 E. Lat. 40. 24 N.

PENISHEHR, a town of Candahar, in the country of Cabul, 46 miles N. of Cabul.

PENITENCE. *s.* (*penitence*, Fr. *pénitencia*, Latin.) Repentance; sorrow for crimes; contrition for sin, with amendment of life or change of the affections (*Dryden*).

PENITENT. *a.* (*penitent*, Fr. *penitens*, Lat.) Repentant; contrite for sin; sorrowful for past transgressions, and resolutely amending life (*Milton*).

PENITENT. *s.* 1. One sorrowful for sin (*Rogers*). 2. One under censures of the church, but admitted to penance (*Stillfleet*). 3. One under the direction of a confessor.

PENITENTIAL. *a.* (from *penitence*.) Expressing penitence; enjoined as penance (*Shakspeare*).

PENITENTIAL. *s.* (*penitenciel*, Fr. *pénitenciale*, low Latin.) A book directing the degrees of penance (*Ayliffe*).

PENITENTIARY, in the ancient Christian church, a name given to certain presbyters or priests, appointed in every church to receive the private confessions of the people, in order to facilitate public discipline, by acquainting them what sins were to be expiated by public penance, and to appoint private penance for such private crimes as were not proper to be publicly censured.

PENITENTIARY, at the court of Rome, is an office in which are examined and delivered out the secret bulls, graces, or dispensations relating to cases of conscience, confessions, &c.

PENITENTIARY, is also an officer, in some cathedrals, vested with power from the bishop to absolve, in cases reserved to him. The pope has at present his grand penitentiary, who is a cardinal, and the chief of the other penitentiary-priests established in the church of Rome,

who consult him in all difficult cases. He presides in the penitentiary, dispatches dispensations, absolutions, &c. and has under him a regent and 24 proctors, or advocates of the sacred penitentiary.

PENITENTLY. *ad.* (from *penitent*.) With repentance; with sorrow for sin; with contrition.

PENKNIFE. *s.* (*pen and knife*.) A knife used to cut pens (*Bacon*).

PENKRIDGE, a town in Staffordshire, with a market on Tuesday, seated on the river Penk, six miles S. of Stafford, and 129 N.W. of London.

PENKUM, a town of Hither Pomerania, seated on a lake, 15 miles S.W. of Stettin.

PENMAENMAWR, a mountain of Wales, in Carnarvonshire, overhanging the sea. It is four miles W. by S. of Aberconway; and the road to Holyhead crosses it on the side of a dreadful precipice, from which it is defended by a wall. The mountain is 1540 feet above the level of the sea.

PENMAN. *s.* (*pen and man*.) 1. One who professes the art of writing. 2. An author; a writer (*Addison*).

PENMANSHIP. *s.* Writing; that which is effected by the pen.

PENN (William), an English admiral, born at Bristol, in 1621. He commanded with Venables at the taking of Jamaica from the Spaniards, in 1655, and the same year was elected member of parliament for Weymouth. He was committed to the tower by Cromwell, for quitting his command without leave, but was soon released. He was chief commander under the duke of York, in the signal and successful battle with the Dutch fleet, in 1664, and was honoured with knighthood. He died in retirement at Wanstead, in Essex, in 1670.

PENN (William), an eminent quaker and writer, son of the above, was born in the parish of St. Catherine's, near the tower, in 1644. He was put to school, first at Chigwell, in Essex, then to a master on Tower-hill, and lastly under the care of a private tutor. One Thomas Loe, a quaker, is said to have confirmed him in his design of uniting with that sect. He was, with many other persons, taken out of a meeting-house at Cork, and imprisoned; and this unjust persecution on a people for opinion's sake strengthened his affection and ties of union with them. His father, though offended with his son, obtained his release. He was, however, afterwards sent to the tower for a book he had written, and during the seven months he was confined he wrote his famous *No Cross, no Crown*. He was so courageous and able a champion in the cause of his oppressed brethren, as to obtain an order for the release of all in prison. In the next year the conventicle act occasioned his being imprisoned a third time. He was also tried at the Old Bailey for preaching to a seditious assembly. He pleaded his own cause and was acquitted, but the jury were fined, and he

was detained in prison. He obtained his own and their release, probably by the interest of his father, for the quakers deem the payment of a fine an acknowledgment of guilt. His father became perfectly reconciled to him before his death, which happened in 1670, for he said to him, "Son William, let nothing in this world tempt you to wrong your conscience: I charge you do nothing against your conscience. So will you keep peace at home, which will be a feast to you in a day of trouble." He had a controversy with Muggleton, the founder of a sect; and held, near Rickmansworth, a public dispute with the no less famous Richard Baxter. He lived many years at Werminghurst, in Sussex, an estate which he had by his wife Gulielma Maria Springett, whose father had been killed at the siege of Bamber, in the civil wars. From this residence, he went, in company with George Fox and Robert Barclay, on a mission to Holland and Germany. In 1681 king Charles granted him, in lieu of arrears due to his father, the province in North America, till then called the New Netherlands, but since Pennsylvania. Mr. Penn's friendly and pacific manner of treating the Indians produced in them an extraordinary love for him and his people; so that they have maintained a perfect amity with the English in Pennsylvania ever since. He died in 1718, at Jordans, near Beaconsfield, of the effects of three apopleptic fits. He left considerable property behind him, having inherited 1500*l.* a year from his father.

At one period of his life, Penn lodged in a house in Norfolk-street in the Strand. In the entrance to it he had a peeping-hole, through which he could see any person that came to him. A creditor one day sent in his name; and having been made to wait more than a reasonable time, he knocked for the servant, whom he asked, "Will not thy master see me?" "Friend, (answered the servant) he has seen thee, but he does not like thee."

He was the greatest bulwark of the Quakers; in whose defence he wrote numberless pieces. Besides the above works, he wrote a great number of others; the most esteemed of which are, 1. His Primitive Christianity revived. 2. His defence of a paper entitled Gospel Truths, against the Exceptions of the bishop of Cork. 3. His Persuasive to Moderation. 4. His Good Advice to the Church of England, Roman Catholic, and Protestant Dissenter. 5. The sandy Foundation shaken. 6. No Cross, no Crown. 7. The great Case of Liberty of Conscience debated. 8. The Christian Quaker and his Testimony stated and vindicated. 9. A Discourse of the general Rule of Faith and Practice, and Judge of Controversy. 10. England's present Interest considered. 11. An Address to Protestants. 12. His Reflections and Maxims. 13. His Advice to his Children. 14. His Rise and Progress of the People called Quakers. 15. A Treatise on Oaths. Most of these have passed several editions, some of them many. The letters between William Penn

and Dr. Tillotson, and William Penn and William Popple, esq. together with Penn's letters to the princess Elizabeth of the Rhine, and the countess of Hornes, as also one to his wife on his going to Pennsylvania, are inserted in his works, which were first collected and published in 2 vols. folio; and the parts since selected and abridged into 1 vol. folio, are very much and deservedly admired for the good sense they contain.

PENNACHED. *a.* (*pennache*, Fr.) Applied to flowers when the ground of the natural colour of their leaves is radiated and diversified neatly without any confusion (*Tre-voux*).

PENNANT. *s.* (*pennon*, Fr.) 1. A small flag, ensign, or colour. 2. A tackle for hoisting things on board.

PENNANT (Thomas), an able naturalist and antiquary, born at Downing, Flintshire, 1726, and educated at Wrexham school, and Oxford. After examining whatever was curious and valuable in England, he travelled on the continent, and was introduced to the learned of Europe, especially Buffon, Voltaire, Linneus, &c. On his return he commenced author, and from 1750, when his British zoology appeared, to the time of his death, he employed himself in elucidating the history, geography, and natural curiosities of his country. He died at Downing, 1793. His works are numerous, the best known are *tour in Scotland*, 1771, often edited—*tours in Wales*, from Chester to London—*account of London*—*literary memoirs of himself*—a geographical account of India, &c.

PENNANTIA, in botany, a genus of the class polygamia, order dioecia. Calyxless; corol five-petalled; stamens five; stigma flat, peltate; pericarp three-sided, two-celled; seeds solitary. One species, a native of New Zealand.

PENNAR, a river of Hindustan, which rises in Mysore, flows by Gooty, Gandicotta, Cuddapah, and Vellore, and enters the Bay of Bengal, at Gangapatnam.

PENNATA FOLIA, winged leaves, among botanists, are such leaves of plants as grow directly one against another, on the same rib or stalk: as those of ash, walnut tree, &c.

PENNATED. *a.* Winged.

PENNATULA. Sea-pen. In zoology, a genus of the class vermes, order zoophyta. Animal not affixed, of various shapes, supported by a bony part within, naked at the base, the upper part with generally lateral ramifications furnished with rows of tubular denticles, producing radiate polypes from each tube. Eighteen species, scattered through the seas of the globe.

This worm is not a coralline, or alcyony, as being unaffixed to any othersubstance, but in other respects it much resembles these tribes. Its figure is that of a quill-feather of a bird's wing; it is usually about four inches long, and of a red colour; along the back there is a groove from the extremity of the feathered

part, as there is in a pen; the feathered part consists of fins proceeding from the stem; these fins move the animal backward and forward in the water, and are furnished with suckers or mouths armed with filaments. The following are the chief species.

1. *P. corinea*. Stem round, radiating, with papillous, polype-bearing sides, and clavate at the top. Inhabits the deeps of the White Sea, and unites the two genera of alcyonium and pennatula: soft, red, an inch and half high; and as thick as the little finger, wrinkled, with the papillæ disposed in rows.

2. *P. phosphorea*. Stem fleshy; with a rough midrib, and imbricated ramifications. Inhabits most seas, and found in those of our own country; emits a very strong phosphoric light in the dark; about four inches long, red; stem villous; rays nearly incumbent, and all pointing one way.

3. *P. encrinus*. Stem quadrangular, taper, very long, bony, covered with a callous membrane, with an umbellate cluster of polypes from the top. Inhabits the Greenland seas; above six feet long; and when taken fresh from the sea appears like a nosegay of yellow flowers; upper part of umbel composed of from twenty to thirty cylindrical polypes, each with eight claws at the tip, and seated on a long pedicle.

PENNER. *s.* (from *pen*.) 1. Writer. 2. A pence (Ainsworth).

PENNICUIK (Alexander), a Scotch physician. He published a topographical account of Tweedale, some poems, descriptive of the manners of his countrymen, &c. He died 1722, aged 70. It is said that he communicated to Allan Ramsay the incidents which form the subject of his Gentle Shepherd.

PENNILESS. *a.* (from *penny*.) Moneyless; poor; wanting money.

PENNON. *s.* (*pennon*, Fr.) A small flag or colour (Shakspeare).

PENNSYLVANIA, one of the United States of America, 288 miles long and 156 broad; bounded on the N. by New York, E. by that province and New Jersey, S. by Delaware, Maryland, and Virginia, W. by the latter and that of Ohio, and N.W. by Lake Erie, on which it has a considerable front, and a good port. It is divided into 23 counties; viz. Philadelphia, Chester, Delaware, Bucks, Montgomery, Berks, Lancaster, Dauphin, Northampton, Luzerne, York, Cumberland, Northumberland, Franklin, Bedford, Huntingdon, Mifflin, Westmorland, Somerset, Fayette, Washington, Allegany, and Lycoming. It is well watered by the Delaware, Schuylkill, Susquehanna, Monongahela, Allegany, and other navigable rivers. Its produce is corn, cattle, potash, wax, skins, and furs; and the principal manufactures are iron, copper, tin, leather, paper, gunpowder, hats, cotton, sugar, and tobacco. Philadelphia is the capital.

This country was granted to the famous William Penn, son of sir William Penn, ad-

miral of the English fleet, in the time of Oliver Cromwell and Charles II. Sir William, as some reward for his services, and in consideration of sundry debts due to him from the crown, was promised a grant of this country from king Charles II, but died before he obtained it. His son did not for some time apply himself strenuously to solicit the grant promised to his father; but at length finding his friends, the Quakers, were harassed in every part of England by spiritual courts, he renewed his application to the court, and having obtained his grant, went into America, and purchased the soil at a very low rate of the Indians, its original possessors. By this cheap act of justice at the beginning, he rendered all his future dealings the more easy, the Indians having conceived very favourable opinions both of him and his designs. Having thus succeeded in the first part of his plan, he proceeded to the other, namely, to people the country he had thus obtained. And this was greatly facilitated by the uneasiness of the English quakers; who, from their high opinion of the man, determined to follow him over the vast Atlantic Ocean, to a country uncultivated, and a climate strange and unknown. Nor was he himself wanting in any thing that had a tendency to encourage his followers: he expended large sums in transporting and supplying them with all necessaries; and not aiming at a sudden fortune, by selling his lands at a very easy purchase. By this means, and the noble charter of privileges he gave the settlers, the country was soon changed from a wilderness to a garden, and is now one of the most flourishing countries in the new world; and still called after his own name. The climate of Pennsylvania is very agreeable, and the air sweet and clear. The fall, or autumn, begins about the 20th of October, and lasts till the beginning of December, when the winter sets in, which continues till March. Frosty weather, and extreme cold seasons, are frequently known here; so that the river Delaware, though very broad, is oftentimes froze over; but, at the same time, the weather is dry and healthy. The spring lasts from March to June, but the weather is then more inconstant than in the other seasons. The heats are very great in the months of July, August, and September, but mitigated so much by cool breezes, that they are very tolerable. The wind is at south-west during great part of the summer, but generally at north and north-west in spring, fall, and winter; which, blowing over the frozen lakes and snowy mountains of Canada, is the true cause of the coldness of the weather in the winter season. The soil is in some places a yellow or black sand; in some a loamy gravel; and in others a fat mould, like the vales in England, especially near the inland brooks and rivers. The earth is fruitful, fat, and easy to be cleared, the roots of the trees being but a small distance below the surface of the ground. It is well watered with rivers, and produces every thing which can render life agreeable in the utmost plenty. In

short, there is no part of America in a more flourishing condition than Pennsylvania; nay, in some years, more people have transported themselves into this province than in all the others. In the grand convention which was held in Philadelphia, in the summer, 1787, the inhabitants in Pennsylvania were reckoned at 360,000. They are now much more numerous, amounting it is affirmed to about 500,000. The inhabitants of Pennsylvania consist of emigrants from England, Ireland, Germany, and Scotland. The Friends and Episcopalians are chiefly of English extraction, and compose about one-third of the inhabitants. They live principally in the city of Philadelphia, and in the counties of Chester, Philadelphia, Bucks, and Montgomery.

PENNY, or PENY, in commerce, an ancient English coin, which had formerly considerable course; but till lately had dwindled into an imaginary money, or money of account. Camden derives the word from the Latin *pecunia*, money.

The ancient English penny, penig, or pening, was the first silver coin struck in England; nay, the only one current among our Saxon ancestors; as is agreed by Camden, Spelman, Dr. Hicks, &c. The penny was equal in weight to our threepence: five of them made one shilling, or scilling Saxon; 30 a mark or mancuse, equal to our 7s. 6d. Till the time of king Edward I. the penny was struck with a cross, so deeply indented in it, that it might be easily broke, and parted, on occasion, into two parts, thence called half-pennies; or into four, thence called fourthings, or farthings. But that prince coined it without indenture; in lieu of which he first struck round halfpence and farthings.

He also reduced the weight of the penny to a standard; ordering that it should weigh 32 grains of wheat, taken out of the middle of the ear. This penny was called the penny sterling.—Twenty of these pence were to weigh an ounce; whence the penny became a weight as well as a coin. See STERLING and PENNY-WEIGHT.

The modern penny, containing the twelfth part of a shilling, or the 240th part of a pound, is a copper coin of rather variable weight, but not much less than an ounce.

PENNY, in ancient statutes, &c. is used for all silver money; and hence the ward-penny, aver-penny, hundred-penny, tithing-penny, and brothal-penny.

PENNYGANT, one of the highest mountains of England, in Yorkshire, seven miles N. of Settle. Its summit is 3930 feet above the level of the sea. On its sides are two awful orifices, called Hulpit and Huntpit holes; through each of them runs a brook, both of which pass under ground for about a mile, and cross each other in the bowels of the earth without mixing their waters.

PENNY-ROYAL, in botany. See MENTHA PULEGIUM.

PENNY-WEIGHT, a Troy weight, containing 24 grains; each grain weighing a grain

of wheat gathered out of the middle of the ear, well dried. The name took its rise hence, that this was anciently the weight of one of our ancient silver pennies. See PENNY.—Twenty of these penny-weights make an ounce Troy.

PENNYWISE. *a.* (*penny and wise.*) Saving of small sums at the hazard of larger; negligently on improper occasions (*Bacon*).

PENNYWORTH. *s.* (*penny and worth.*) 1. As much as is bought for a penny. 2. Any purchase; any thing bought or sold for money (*South*). 3. Something advantageously bought; a purchase got for less than it is worth (*Dry*). 4. A small quantity (*Swift*).

PENRITH, a town in Cumberland, with a market on Tuesday, and a castle. Several remains of antiquity are seen in its neighbourhood. It is seated under a hill, near the rivers Eymot and Lowther, 18 miles S. of Carlisle, and 280 N.N.W. of London. Lon. 2. 52 W. Lat. 54. 40 N.

PENRUDDOCK (John), was zealous in the cause of his sovereign during the civil wars, and obtained the rank of colonel in the army. He was defeated by Croke, who, after he had promised him pardon, caused him to be beheaded in 1665. The letters which passed between him and his wife, after his condemnation, have been published by Steele, and exhibit him in the amiable light of the good christian and the loyal subject.

PENRYN, a borough in Cornwall, with a market on Wednesday, Friday, and Saturday. It has a great trade in the pilchard and Newfoundland fisheries, is governed by a mayor, and sends two members to parliament. It is seated on a creek of Falmouth Haven, three miles N.W. of Falmouth, and 266 W. by S. of London. Lon. 4. 59 W. Lat. 50. 10 N.

PENSACOLA, the capital of W. Florida, seated on a bay of the gulph of Mexico, which forms a very commodious harbour, where vessels may ride secure from every wind. Lon. 85. 24 W. Lat. 30. 32 N.

PENSANCE, or PENZANCE, a seaport in Cornwall, with a market on Thursday. It was burnt by the Spaniards in 1593, but has been rebuilt, and carries on a considerable traffic in pilchards and tin. It is one of the tin-coinage towns, and a corporation, governed by a mayor. It is seated on a creek of Mounts Bay, 12 miles E. of the Land's End, and 281 W. by S. of London. Lon. 5. 35 W. Lat. 50. 11 N.

PENSFORD, a town in Somersetshire, with a market on Tuesday. It is noted for its hats and bread, and seated on the Chew, seven miles W. of Bath, and 117 W. by S. of London. Lon. 2. 30 W. Lat. 51. 23 N.

PENSILE. *a.* (*pensilis*, Latin.) 1. Hanging; suspended (*Bacon*). 2. Supported above the ground (*Prior*).

PENSILENESS. *s.* (from *pensile*.) The state of hanging.

PENSION. *s.* (*pension*, Fr.) An allowance made to any one without an equivalent (*Add.*)

Fig. 1. Pentagraph.

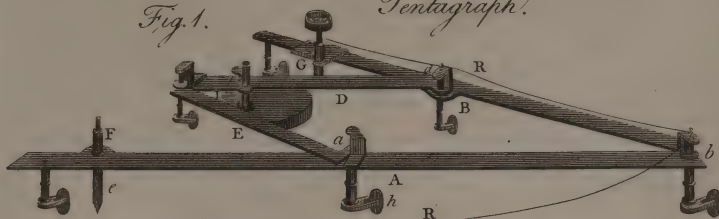


Fig. 2.



Fig. 3.



Fig. 4.

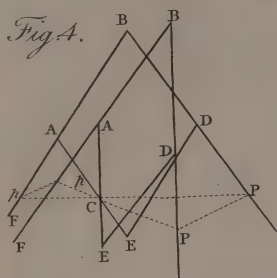


Fig. 5.

Perambulator.

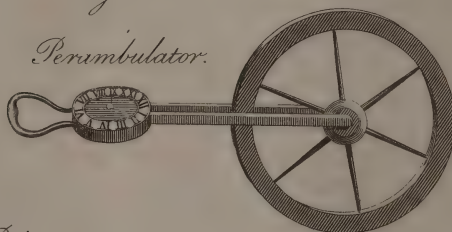


Fig. 6.

Jugwells Pedometer.

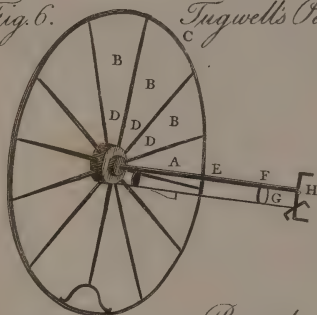


Fig. 7.

Percussion.

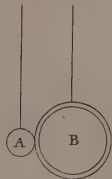


Fig. 8.

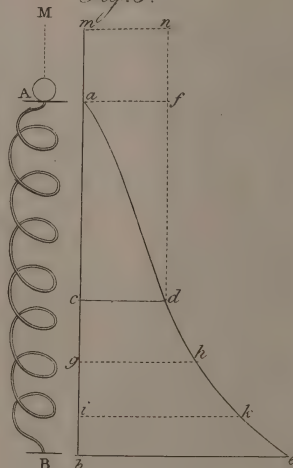
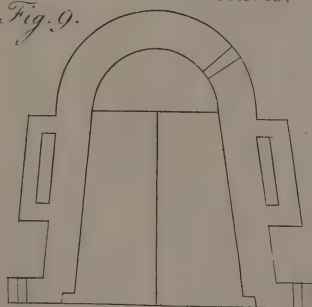


Fig. 9.

Petard.



To PENSION. *v. a.* (from the noun.) To support by an arbitrary allowance (*Addison*).

PENSIONARY. *a.* (*pensionnaire*, French.) Maintained by pensions (*Donne*).

PENSIONER, in general, denotes a person who receives a pension, yearly salary, or allowance. Hence,

The Band of Gentlemen Pensioners, the noblest sort of guard to the king's person consists of 40 gentlemen, who receive a yearly pension of 100*l*.

This honourable band was first instituted by Henry VIII. and their office is to attend the king's person, with their battle-axes, to and from his chapel-royal, and to receive him in the presence-chamber, or coming out of his privy-lodgings; they are also to attend at all great solemnities, as coronations, St. George's feast, public audiences of ambassadors, at the sovereign's going to parliament, &c.

They are each obliged to keep three double horses and a servant, and so are properly a troop of horse. They wait half at a time quarterly; but on Christmas-day, Easter-day, Whitsunday, &c. and on extraordinary occasions, they are all obliged to give their attendance. They have likewise the honour to carry up the sovereign's dinner on the coronation-day and St. George's feast; at which times the king or queen usually confers the honour of knighthood on two such gentlemen of the band as their captain presents. Their arms are gilt battle-axes; and their weapons, on horseback, in time of war, are cuirassiers-arms, with sword and pistols. Their standard in time of war is, argent, a cross gules. Their captain is always a nobleman, who has under him a lieutenant, a standard-bearer, a clerk of the check, secretary, pay-master, and harbinger.

PENSIONER, in the university of Cambridge and in that of Dublin, has a very peculiar meaning; for those students, either undergraduates or bachelors of arts, are called pensioners who live wholly at their own expence, and who receive no emolument whatever from the college of which they are members. They are divided into two kinds, the greater and the less; the former of which are generally called fellow-commoners, because they eat with the fellows of their college; the latter are always called pensioners, and eat with the scholars, who are those students of the college, either undergraduates or bachelors, who are upon the foundation, who receive emoluments from the society, and who are capable of being elected fellows. See *SERVITOR* and *SIZAR*.

PENSIVE. *a.* (*pensif*, Fr. *pensivo*, Italian.) Sorrowfully thoughtful; sorrowful; mournfully serious; melancholy (*Pope*).

PENSIVELY. *ad.* With melancholy; sorrowfully; with gloomy seriousness (*Spenser*).

PENSIVENESS. *s.* (from *pensive*.) Melancholy; sorrowfulness (*Hooker*).

PENSTEMON, in botany, a genus of the class didynamia, order angiospermia. Calyx five-leaved; corol two-lipped, inflated; rudiment of a fifth filament bearded; capsule two-celled. Four species natives of Virginia, or of

Mexico. Of these one, *P. laevigata*, is cultivated in our pleasure gardens, with dichotomous flowering branches, flowers two together, corol pale purple, somewhat hirsute on the outside.

PENSTOCK, a sluice or flood-gate, serving to retain or let go at pleasure the water of a mill-pond, or the like.

PENT. part. pass. of *pen*. Shut up. (*Dryden*).

PENTACAPSULAR. *a.* (*penté* and *capsular*.) Having five cavities.

PENTACHORD. *s.* (*penté* and *χορδή*.) An instrument with five strings.

PENTACOCCEOUS CAPSULE, in botany, a five-grained capsule. Swelling out in five protuberances; or, having five united cells, with one seed in each.

PENTADACTYLON. Five fingers. In botany, a name given by some authors to the ricinus, or palma Christi, from the figure of its leaf.

PENTAGON, in geometry, a plane figure consisting of five angles, and consequently five sides also. If the angles be all equal, it is a regular pentagon.

It is a remarkable property of the pentagon, that its side is equal in power to the sides of a hexagon and a decagon inscribed in the same circle; that is, the square of the side of the pentagon, is equal to both the squares taken together of the sides of the other two figures; and consequently those three sides will constitute a right-angled triangle. To find the area of a regular pentagon, multiply the square of its side into the number 1.7204774.

PENTAGONAL. *a.* Quinquangular; having five angles.

PENTAGONOUS or **PENTAGONAL STEM.** A five-cornered stem. It is a species of Linnéus's ancipital stem, and he seems to distinguish it from quinquangular.—He describes the capsule of euonymus as being pentagona; quinquangularis.

PENTAGRAPH, or **PARALLELOGRAM**, an instrument whereby designs of any kind may be copied in what proportion you please, without being skilled in drawing.

A pentagraph is composed of 4 bars, ABDE, plate 133, fig. 1. usually of brass; the bar A is jointed to B at *b* about the middle, and at *a* it is connected with E: the bar B is the same length as A; and at *d* is jointed to the bar *d*, whose end is connected with the end of E; these four bars form a parallelogram: thus, *ba* = D, and *bd* = E. To the other end of the bar A, a tube F is soldered, through which a pointed brass rod *e*, called the tracer, is put; the end of the bar B has a slider G upon it, which has a tube similar to F; another slider I of the same kind is mounted on the bar D. These sliders have screws, by which they can be fixed at any distance. Under each of the joints of the base a small tube is fixed, in the bottom of which is a small castor as H, which makes the instrument run easily on the table. When the instrument is used, the two sliders GI must be set exactly in a line with the tube

F; when it is required to make a copy of a drawing of the same size, the sliders must be set so that from **F** to **I** is the same distance as from **I** to **G**; the tube **I** must then have a wire put through it, whose lowest end is fast screwed to a heavy leaden weight, **L**; this must have three sharp points in the under side, so that when it is set on the table it may not be liable to move; then if a design or drawing is laid under the tube **F**, and the point of the tracer drawn over the lines of it, the point of the pencil at **G** will describe a similar figure. If the drawing is to be reduced to one-half of the size, the weight must be put to the slider **G**, and the pencil into **I**, without moving either slider; then the distance from the tracer to the fixed point or weight **L**, is twice the distance of the pencil to the weight. The rule for setting the sliders for any proportion is, as the distance between the tracer *e* and the fixed point **L**, is to the distance between the pencil **G** and the same, so is the length of any line described by the tracer, to the length of the line at the same time described by the pencil. To avoid the trouble of measuring these distances each time, the bars **B** and **D** are divided into ten or twenty of the most common proportions, by which divisions the sliders are to be fixed.

The construction of one of the sliders is shewn in fig. 2; where **M** is a piece of brass, to one corner of which a tube *g* is soldered; an opening of the same width as the bar is cut in this, and a cover **N** is screwed on with two screws: this cover has a screw with a mill-head through it, by which the slider is fixed. A piece of brass **O**, a little bent, is put between the bar and the under side of the cover, and whose elasticity prevents the slider moving too freely when the screw is slack, and defends the bar from being scratched by the ends of the screw when it is fixed.

Fig. 3, describes the method of making the joints of the rods: **P** is the end of one bar, which has a steel spindle *p* screwed fast to it; the other bar *o* has a cock *v*, screwed on, whose upper end projects over the tube *t*, and has a hole through it, just over the hole in the tube. The ends of the spindle **P** are put between the holes in the cock and the hole in the tube; if the spindles are well fitted, this joint is very steady, and without any shake. The lower end of the tube *t* has a hole drilled in it, into which the spindle **W** of the castor is put; the castor is kept from falling out of the tube, by the point of a small screw going through the side of the tube *t*, which takes into a notch cut round in the top of the spindle *w*. When the machine is used, a fine line, **RR**, is put through rings in the cocks *bd*, and tied to the pencil; the other end has a loop to be hooked over the thumb of the operator, by pulling which he can raise the pencil at **D**, when he does not wish it to mark.

In order to prove that the figure described by a pentagraph is similar to the given figure; let **C**, fig. 4, be the fixed centre of motion; **P**

the pencil for tracing the given figure **PP**, and *p* the pencil, which traces the other figure *pp*; *p*, &c. must be so adjusted, that *p*, **C** and **P**, may lie in one straight line; then, since **B** *p* : **A** *p* :: **B** **P** : **A** **C**, whatever be the situation of the pentagraph, the angles **PCP** and *pCp*, are vertical, and, therefore, **PCp** will in every position of the instrument be a right line: but **PC** : *pC* :: **BA** : *Ap*, in each of the two positions in the figure, and consequently the triangles **PCP**, *pCp*, are similar; and **PP** : *pp* (:: **PC** : *pC*) :: **BA** : *Ap*, or in a given ratio. Hence it appears, that by moving the pencil *p*, *Ap* may be equal to **BA**, or less in any proportion; and consequently *pp* may be equal to **PP**, or less, in the same proportion.

PENTAGYNIA, in botany, the name of one of the orders in the fifth, tenth, eleventh, twelfth, and thirteenth classes in the Linnæan system; containing those plants which have five pistils in a hermaphrodite flower.

PENTAMETER. (from *πενταμετρος*, *q*; d. five measures.) In poetry, a kind of verse, consisting of five feet or metres.

The two first feet of a pentameter may be either dactyls or spondees; the third must be always a spondee; and the two last anapaests.

It is usually joined to hexameters, in elegies, epistles, epigrams, and other little pieces. There is no work extant of pentameters alone.

PENTANDRIA, in botany, the name of the fifth class in Linnæus's system; comprehending those plants which have hermaphrodite flowers with five stamens.

PENTANGULAR. *a.* (πεντε and angular.) Five cornered (*Grew*).

PENTAPETALOUS. *a.* (πεντε and *πτελον*.) Having five petals or leaves.

PENTAPETES. In botany, a genus of the class monadelphia, order dodecandria. Calyx double, the outer three-leaved, caducous; petals five; stamens twenty, five of them barren; style obsoletely five-toothed; capsules five-celled, many-seeded; with the partitions contrary. One species, *P. Phoenicea*, scarlet-flowered pentapetes, an East-Indian annual, which dies in the autumn, soon after it has ripened its seeds.

PENTAPHYLLOUS CALYX, in botany, a five-leaved calyx, or rather perianth: as in *Cistus*, *Adonis*, *Cerbera*.

PENTAPHYLLUM. (*pentaphyllum*, *πενταφυλλον*, from *πεντε*, five, and *φυλλον*, a leaf; so named because it has five leaves on each stalk.) Common cinquefoil, or five-leaved grass. The roots of this plant, *potentilla reptans*; *foliis quinatis*, *caule repente*, *pedunculis unifloris* of Linnæus. *C. O.* *Icosandria*, *polygynia*; have a bitterish styptic taste. They were used by the ancients in the cure of intermittents; but the medicinal quality of cinquefoil is confined, in the present day, to stop diarrhoeas and other fluxes. See **POTENTILLA**.

PENTAPOLIS, a part of Africa, near Cy-

rene. It received this name on account of the five cities which it contained; Cyrene, Arsinoe, Berenice, Ptolemais or Barce, and Apollonia.

PENTASPACT. *s.* (πεντα and σπασω.) An engine with five pallies.

PENTASTIC. *s.* (πεντα and στιχος.) A composition consisting of five verses.

PENTASTYLE. *s.* (πεντα and στυλος.) In architecture, a work in which are five rows of columns.

PENTATEUCH. This word, which is derived from the Greek πεντατευχος, from πεντε, five, and τευχος, an instrument or volume, signifies the collection of the five instruments or books of Moses, which are Genesis, Exodus, Leviticus, Numbers, and Deuteronomy; each of which books we have given an account of under their several names.

The Jews read the whole Pentateuch every year; and for this purpose they divide it into paragraphs or sections, which they distinguish into great and small. The great are those which they read in a week, of which there are fifty-four (see PARASCHE); and the small regard particular matters. Each greater section, which is denominated by the word with which it begins, is divided into seven parts, because they are read by so many different persons: the priest begins, afterwards a Levite; and in the choice of the other readers respect is paid to the rank of the people. After the text of Moses, they read a paragraph of the paraphrase of Onkelos. The books of the prophets are also divided in the same manner.

PENTATHLON, πενταθλον, in antiquity, the five exercises performed at the Grecian games, and for which prizes were proposed.

These exercises were wrestling, darting, leaping, running, and quoit-playing. He who bore away the prize in them all was called pentathlus; by the Latins, quinquertio; as the five exercises themselves were by those latter people called quinquertium.

PENTATONON, in the ancient music, a concord, by us called the redundant sixth.

It consists of four tones, and a major and minor semitone; whence the name, pentatonon, q. d. five tones.

PENTECONTARCHA, among the ancients, the captain or commander of a galley, called penteconteros.

PENTECONTEROS, πεντηκοντερος, a vessel with fifty oars.

PENTECOST, πεντηκοστη, Whitsuntide; a solemn feast of the church, held in commemoration of the descent of the Holy Ghost on the apostles; as described in the Acts. See WHITSUNTIDE.

It has its name from the Greek πεντηκοστη, q. d. quinquagesimus, fiftieth, because held on the fiftieth day after Easter.

In the ancient church Pentecost finished the paschal time, or Easter season; wherein, as Tertullian, St. Jerom, &c. observe, Hallelujah was sung every where, the office celebrated standing, no fasting allowed, &c.

The Jews likewise had a feast they called

Pentecost, or Quinquagesimus, solemnized in memory of the Laws being given to Moses, fifty days after their departure out of Egypt.

This was the second of the three grand festivals in the ecclesiastical year, at which all the males were to appear before the Lord at the national altar. It is called by several names in the Old Testament; as the Feast of Weeks, because it was celebrated seven weeks, or a week of weeks, after the Passover, or rather, after the first day of the feast of unleavened bread; the Feast of Harvest, according to Mede and Bochart, because, as the harvest begun at the Passover, it ended at Pentecost; or, according to others, because at this feast the first fruits of their wheat harvest were brought and offered to God; and the Feast of First Fruits.

PENTECOSTALS, *Pentecostalia*, anciently, were pious oblations made at the feast of Pentecost, by the parishioners to their parish-priest; and sometimes by inferior churches or parishes, to the principal or mother-church.

PENTHESILEA, a queen of the Amazons, daughter of Mars. She came to assist Priam in the Trojan war, and fought against Achilles, by whom she was slain. The hero was so struck with the beauty of Pentheseilea when he stripped her of her arms, that he even shed tears for her fate. Thersites laughed at the partiality of the hero, for which ridicule he was instantly killed. The death of Thersites so offended Diomedes, that he dragged the body of Pentheseilea out of the camp, and threw it into the Scamander. It is generally supposed, that Achilles was enamoured of the Amazon before he fought with her, and that she had by him a son called Cayster.

PENTHEUS, son of Echion and Agave, king of Thebes in Boeotia, forbad his subjects to pay adoration to Bacchus. He even ordered the god himself, who conducted the Theban women in the celebration of the orgies, to be seized and imprisoned. The god however escaped, and Pentheus then commanded all the bacchanals to be destroyed. And when the Theban women had gone out of the city to celebrate the orgies of Bacchus, Pentheus, apprized of the debauchery which attended the solemnity, ordered the god himself, who conducted the religious multitude, to be seized. His orders were obeyed with reluctance; but when the doors of the prison in which Bacchus had been confined, opened of their own accord, Pentheus became more irritated, and commanded his soldiers to destroy the whole band of the bacchanals. Bacchus then inspired the monarch with an ardent desire of seeing the orgies. Accordingly he hid himself in a wood for the purpose on mount Cithæron. But his curiosity proved fatal; the bacchanals all rushed upon him. His mother was the first who attacked him, and next her two sisters, Ino and Autonoe, and his body was torn to pieces.

PENTHORUM, in botany, a genus of the class decandria, order decangynia, Calyx

five or ten-cleft; petals from none to five; capsule five-beaked, five-celled. One species: an herbaceous plant of Virginia.

PENTHOUSE. *s.* (*pent*, from *penté*, Fr. and *house*.) A shed hanging out aslope from the main wall (*Knolles*).

PENTICE. *s.* (*pendice*, Italian.) A sloping roof (*Wotton*).

PENTILE. *s.* (*pent* and *tile*.) A tile formed to cover the sloping part of the roof (*Moxon*).

PENT up. *part. a.* (*pent*, from *pen*, and *up*.) Shut up (*Shakspeare*).

PENTLAND FRITH, a strait which divides the Orkney Islands from Caithnessshire, in Scotland. It is 20 miles long and 10 broad, and very dangerous to those who are not well acquainted with its tides and currents; especially in passing the Pentland Skerries, a cluster of rocks at the E. entrance of the frith.

PENTLAND HILLS, a ridge of mountains, in Edinburghshire, extending about ten miles from S.W. to N.E.

PENULTIMA, or **PENULTIMATE SYLLABLE**, in grammar, denotes the last syllable but one of a word; and hence the antepenultimate syllable is the last but two, or that immediately before the penultima.

PENUMBRA, in astronomy, a partial shade observed between the perfect shadow and the full light in an eclipse. It arises from the magnitude of the sun's body; for, were he only a luminous point, the shadow would be all perfect; but, by reason of the diameter of the sun, it happens that a place which is not illuminated by the whole body of the sun does yet receive rays from a part thereof.

PENURIOUS. *a.* (from *penuria*, Latin.) 1. Niggardly; sparing; not liberal; sordidly mean (*Prior*). 2. Scanty; not plentiful (*Addison*).

PENURIOUSLY. *ad.* (from *penurious*.) Sparingly; not plentifully.

PENURIOUSNESS. *s.* (from *penurious*.) 1. Niggardliness; parsimony (*Addison*). 2. Scantiness; not plenty.

PENURY. *s.* (*penuria*, Lat.) Poverty; indigence (*Hooker*).

PENTRIA, in botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle naked; seeds crowned with a jagged membranaceous margin; calyx imbricate, hæmisphærical. One species, a Cape plant, by some regarded as a tanacetum, with silky downy branches; leaves crowded, wedge-form, unequally crenate at the tip; umbel terminal.

PE'ONY, in botany. See **PÆONIA**.

PEOPLE. *s.* (*peuple*, Fr. *populus*, Latin.) 1. A nation; those who compose a community (*Shakspeare*). 2. The vulgar (*Waller*). 3. The commonalty; not the princes or nobles (*Addison*). 4. Persons of a particular class (*Bacon*). 5. Men, or persons in general (*Arbutnot*).

To PE'OPLE. *v. a.* (*peupler*, Fr.) To stock with inhabitants (*Prior*).

PEPIN DE HERISTAL, or **LE GROS**,

mayor of the palace under Clovis III. Childerbert, and Dagobert. The power of these mayors in France was so great, that they left the sovereign only the empty title, and in the end seized on the throne itself.

PEPIN LE BRIEF, or **LE PETIT**, grandson to Pepin le Gros, and first king of the second race of French monarchs, was mayor of the palace to Childeric III. a weak prince. He contrived to confine him and his son Thierri in different monasteries; and then, with the assistance of pope Stephen III. he usurped the sovereign power. He died in 768, aged 54.

PEPLIS. Water-purslane. In botany, a genus of the class hexandria, order monogynia. Calyx campanulate, with a twelve-cleft mouth; petals six, inserted into the calyx; capsule superior, two-celled. Two species, creeping plants, one common to our own marshes, one a native of India.

PEPLUS, a long robe worn by the women in ancient times, reaching down to the feet, without sleeves, and so very fine that the shape of the body might be seen through it. The Athenians used much ceremony in making the peplus, and dressing the statue of Minerva with it. Homer makes frequent mention of the peplus of that goddess.

PEPPER. In botany. See **PIPER**.

PEPPER (Bell). In botany. See **CAPSICUM**.

PEPPER (Bird). In botany. See **CAPSICUM**.

PEPPER (Grape). In botany. See **VITIS**.

PEPPER (Guinea). In botany. See **CAPSICUM**.

PEPPER (Jamaica). In botany. See **MYRTUS**.

PEPPER MINT. In botany. See **MENTHA**.

PEPPER WALL. In botany. See **SEDUM**.

PEPPER WORT. In botany. See **LEPIDIUM**.

To PEPPER. *v. a.* (from the noun.) 1. To sprinkle with pepper. 2. To beat; to mangle with shot or blows (*Shakspeare*).

PEPPERBOX. *s.* (*pepper* and *box*.) A box for holding pepper (*Shakspeare*).

PEPPER CORN. *s.* 1. A corn of pepper. 2. Any thing of inconsiderable value.

PEPTICS. (*πεπτικά*, from *πεπα*, to ripen.) In medicine, digestive ointments and other materials.

PEPUSCH (John Christopher), a musician, born at Berlin, 1667. At the age of fourteen he was employed at the Prussian court as a teacher of music. In 1700, he came over to England, and was engaged at Drury-lane; and in 1713, he was admitted doctor of music at Oxford. About 1725, he married de l'Epine, an Italian singer of light character, but who had, by her engagements on the stage, amassed a fortune of 10,000 guineas. This woman, whose figure and complexion entitled her to the appellation of Hecate, by which her husband distinguished her, brought him one son, who died early. Pepusch died 1752, aged 85.

Pæonia Moutan.
Chinese Tree Pæony.



PEPYS (Samuel), an Englishman, secretary to the admiralty under Charles II. and his brother. He introduced regularity, and method in his department, and devoted himself to the collecting of memoirs of the navy, and other valuable documents, preserved at Magdalen college, Cambridge. To his judicious arrangements Britain is much indebted for her superiority in naval affairs, which she began to acquire after the civil wars. He died 1703.

PERACUTE. *a.* (*peracutus*, Latin.) Very sharp; very violent (*Harvey*).

PERADVENTURE. *ad.* (*par adventure*, French.) 1. Perhaps; may be; by chance (*Digby*). 2. Doubt; question: not properly (*South*).

To **PERA'GRATE**. *v. a.* (*peragro*, Latin.) To wander over; to ramble through.

PERAGRATION. *s.* (from *peragrate*.) The act of passing through any state or space (*Holder*).

To **PERA'MBULATE**. *v. a.* (*perambulo*, Lat.) 1. To walk through. 2. To survey, by passing through (*Davies*).

PERAMBULATION. *s.* (from *perambulare*.) 1. The act of passing through or wandering over (*Bac.*). 2. A travelling survey. 3. A district; limit of jurisdiction (*Holyday*).

PERAMBULATOR, an instrument for measuring distances, invented by bishop Wilkins. It is also sometimes called pedometer, waywiser, and surveying wheel.

This wheel is contrived to measure out a pole, or $16\frac{1}{2}$ feet, in making two revolutions; consequently its circumference is $8\frac{1}{4}$ feet, and its diameter 2-626 feet, or 2 feet $5\frac{1}{2}$ inches and $\frac{109}{1000}$ parts, very nearly. It is either driven forward by two handles, by a person walking; or is drawn by a coach wheel, &c. to which it is attached by a pole. It contains various movements, by wheels, or clock-work, with indices on its face, which is like that of a clock, to point out the distance passed over, in miles, furlongs, poles, yards, &c.

Its advantages are its readiness and expedition; being very useful for measuring roads, and great distances on level ground. See the fig. pl. 133, fig. 5.

An ingenious contrivance of this kind which deserves attention here, is the pedometer invented by Mr. Lowin Tugwell, of Beverstone, in the county of Gloucester, and which is represented in pl. 133, fig. 6, where A, is the stock of the pedometer; B, B, B, &c. twelve spokes; one end of which is fastened by means of a screw to the outward ring, or periphery of the wheel, while the other is inserted in the stock. C, the periphery, which is an iron ring sixteen and half feet, or one pole, in circumference; and which is divided into twenty-five equal parts, corresponding to the links of Gunter's chain for land-measuring, &c. D, D, D, &c. are twelve small plates, representing the separate spokes, and each of which includes two links of the chain above-mentioned; the twelfth spoke being divided at its foot, for comprehending the twenty-fifth link. E, an iron axis, being a screw with 320 circumlocutions, each of which is

marked separately on an engraved index on one of its sides; and, in order to apply this part of the machine, it is screwed firmly into the stock of the wheel, with which it revolves when in motion. F, a style, or alidade, being an expanding screw-nut, that embraces the axis, along which it screws, as the latter revolves with the wheel; and as each revolution describes an exact longitudinal pole (four of which are computed to a chain), the style being pendant, and moving towards its proper figure, denotes the length of ground passed; and it is divided into chains and poles on the index of the axis E, and into links on the periphery C. G, is a small adjusting screw; which being turned, the style may be removed to the beginning of the index, after the given line, in surveying or measuring land, has been ascertained in chains, poles, &c. H, represents a cross, or square, with sights for determining perpendiculars in land-measuring. It is suspended at its ends on the axis, whence it may be occasionally detached by a simple touch of the finger and thumb, when in use. Further, this cross prevents the style from being revolved with the axis by any accident. As the 320 divisions marked on the index of the axis E, describe a mile, the style F, after having passed over them, will stop; and, as it will now move round with the axis, it will carry with it the standard; which will strike on the wrist of the operator, and thus prevent him from proceeding to any further distance, till he withdraws his hand from between such standard and the axis. Having received this hint, he turns the screw G; puts the style F back to the bottom of the index; and continues the revolution of the machine, till he has completed his course.

Mr. Tugwell's contrivance is particularly calculated to prevent error in measuring land: as one person may thus survey with greater accuracy and expedition, than by the use of the chain alone. Besides, no fraud can possibly be committed by labourers, in measuring task-work; a circumstance of the utmost importance to agriculturists.

PERCA. *Perch*. In zoology, a genus of the class pisces, order thoracica. Jaws unequal; teeth sharp, incurved; gill-covers scaly, of three laminae, the upper serrate; gill-membrane seven-rayed; lateral line arched with the back; scales hard, rough; fins spinous; vent nearer the head than the tail. Sixty species, scattered through the seas of the globe, four or five of which are found in waters belonging to our own country. They are thus divided into sections.

A. Dorsal fins two, distinct.

B. Dorsal fin single; tail undivided.

C. Dorsal fin single; tail forked.

The following are chiefly worthy of notice:

1. *P. fluviatilis*. Common or river Perch.

Second dorsal fin with sixteen rays.

2. *P. labrax*. Basse. Second dorsal fin with fourteen rays; back dusky, tinged with blue; belly white.

Both these are British fishes, and possess a peculiar tenacity to life. The former grows to two

feet long; swims with great swiftness at a certain height in the water; easily takes a bait; feeds on aquatic insects and smaller fishes; spawns in May and June, and is very prolific; it has no real air-bladder, and from its integuments may be obtained a kind of glue.

The ancients were acquainted with this species; and among them it was deemed one of the first delicacies of the table.

*Nec te, delicias mensarum, perca, silebo
Ammigenos inter pisces dignande marinis.*

AUSONIUS.

Rondelet, and after him Gesner, blames the physicians in his time for ordering the river perch to their patients in febrile disorders, after a prescription of Galen, who meant the sea perch, a fish much lighter, as he alleges, and easier of digestion. Experience, however, has shewn that this distinction is made without a difference; both the sea and river kind being found equally palatable and salubrious. In the time of Willoughby this prejudice against the river perch had been forgotten: he approves of the taste of Ausonius, in deeming the flesh of this animal a great delicacy.

The river perch is easily caught with common earth worms, or small frogs, for a bait; and is so voracious, that the angler, who falls in with a shoal of them, will sometimes kill the whole. This species seldom grows to a large size, few being found above five or six pounds, and the greater number much below this weight. The body is deep and oval shaped; the scales rough; the back much arched; the side line nearer it than the belly. A minute description of a fish so common would be unnecessary.

The basse is distinguished by an uncommon degree of voracity, and hence was termed a wolf (*lupus*) by Ovid, a name frequently adopted by succeeding writers. In the salt water pools of Italy, it sometimes attains to a prodigious size, and weighs fifteen pounds; the flesh is extremely grateful to the taste: in the lakes these fishes are frequently found by the fishermen frozen to death, as they suppose, but more probably suffocated by the exclusion of the air from the surface of the water; a circumstance from which Willoughby takes occasion to caution those who keep them in ponds to break the ice frequently during the continuance of frost. This species inhabits indiscriminately lakes, rivers, and the sea; to the two former, however, they probably ascend from the sea, for they do not seem to breed in fresh water.

Upon the back there are two fins, both radiated with spines: behind the anus another arises and proceeds towards the tail, strengthened with fourteen rays; the three first spinous: the pectoral and ventral fins have each a mixture of prickly and cartilaginous rays. The scales are very thick set. The body is shaped like a salmon.

P. scandens. Climbing perch. Dorsal fin with seventeen spinous and eight soft rays; scales rough with a whitish denticulate edge. Inhabits rivers in Tranquebar, about a palm long;

has the very singular habit of crawling up trees, which it effects by means of the spines in the gill-covers, and spinous rays of the other fins. Body covered with a black slimy mucus, above dusky green, lighter on the sides, beneath pale-golden.

4. *P. cernua.* Ruffe. Dorsal fin twenty-seven rayed, spines fifteen; head thick, compressed; eyes large, pupil blue, irids brown with a yellow mark. Inhabits the clearstreams of our own country and of Europe generally; from six to eight inches long; body round, mucous, sides yellowish-dirty green, spotted with black, breast white, nape and back blackish; feeds on smaller fishes, and is the prey of larger and of various aquatic birds; is exceedingly fertile, and spawns in March or April: flesh good.

5 *P. migra.* Black fish. Body narrow, with small thin scales. Inhabits Cornwall; length fifteen inches. A very indistinct species.

6. *P. formosa.* Squirrel fish. Tail lunate; head marked with blue lines and blotches. Inhabits Carolina; gill-covers toothed; anterior part of the dorsal fin abbreviate towards the hind-part.

*PERCASE. *ad.* (*par* and *case*.) Perchance; perhaps: not used (*Bacon*).

PERCEANT. *a.* (*percant*, Fr.) Piercing; penetrating: obsolete (*Spenser*).

PERCEIVABLE. *a.* (from *perceive*.) Perceptible; such as falls under perception (*Locke*).

PERCEIVABLY. *ad.* (from *perceivable*.) In such manner as may be observed or known.

To PERCEIVE. *v. a.* (*percipio*, Lat.). 1. To discover by some sensible effects (*Shaks.*). 2. To know; to observe (*Locke*). 3. To be affected by (*Bacon*).

PERCEPTIBILITY. *s.* (from *perceptible*.) 1. The state of being an object of the senses or mind; the state of being perceptible. 2. Perception; the power of perceiving: not proper (*More*).

PERCEPTIBLE. *a.* (*perceptible*, French, *perceptus*, Latin.) Such as may be known or observed (*Bacon*).

PERCEPTIBLY. *ad.* (from *perceptible*.) In such a manner as may be perceived (*Pope*).

PERCEPTION. *s.* (*perceptio*, Lat.) 1. The power of perceiving; knowledge; consciousness (*Bentley*). 2. The act of perceiving; observation. 3. Notion; idea (*Hale*). 4. The state of being affected by something (*Bacon*).

A PERCEPTION is a word which cannot but be well understood, though it is difficult for the lexicographer to give any explanation of it. It has been called the first and most simple act of the mind by which it is conscious of its own ideas. This definition, however, is improper, as it confounds perception with consciousness; although the objects of the former faculty are things without us, those of the latter the energies of our own minds. Perception is that power or faculty by which, through the medium of the senses, we have the cognizance of objects distinct and apart from ourselves, and

learn that we are but a small part in the system of nature.

PERCEPTIVE. *a.* (*perceptus*, Lat.) Having the power of perceiving (*Glanville*).

PERCEPTIVITY. *s.* (from *perceptive*.) The power of perception or thinking (*Locke*).

PERCH, in ichthyology. See **PERCA**.

PERCH, in land measuring, a rod or pole of 16½ feet in length, of which 40 in length and 4 in breadth make an acre of ground. But, by the customs of several counties, there is a difference in this measure. In Staffordshire it is 24 feet; and in the forest of Sherwood 25 feet, the foot being there 18 inches long; and in Herefordshire a perch of ditching is 21 feet, the perch of walling 16½ feet, and a pole of densed ground is 12 feet, &c.

PERCH, the small horizontal bar in a cage, on which a bird sits.

PERCH OF A CARRIAGE, the bar which joins the axle-tree of the front wheels to that of the hind wheels.

To PERCH. *v. n.* (*percher*, French; from the noun.) To sit or roost as a bird (*Spenser*).

To PERCH. *v. a.* To place on a perch (*More*).

PERCHANCE. *ad.* (*per* and *chance*.) Perhaps; peradventure (*Wotton*).

PERCHERS. *s.* Paris candles used in England in ancient times; also the larger sort of wax candles, which were usually set upon the altar.

PERCHE, a late province of France, in Orleans, 35 miles long and 30 broad; bounded on the N. by Normandy, on the W. and S. by Maine, and on the E. by Beauce. It takes its name from a forest, and is pretty fertile. It now forms, with part of Normandy, the department of Orne.

PERCH FISHING. See **ANGLING** and **FISHING**.

PERCIPIENT. *a.* (*percipiens*, Latin.) Perceiving; having the power of perception.

PERCIPIENT. *s.* One that has the power of perceiving (*Glanville*).

PERCIVAL (Thomas), a physician, born and educated at Warrington, Lancashire. He studied at Edinburgh, and took his degrees at Leyden, 1765. He settled in 1767, at Manchester, where he continued to practise with increasing reputation till his death in 1804. He was a most amiable man, and to his zeal in the cause of philosophy Manchester is chiefly indebted for the establishment of its literary society, to whose memoirs he made many contributions. He published besides, *Moral and Literary Dissertations*; *Medical Ethics*, &c. besides a *Father's Instructions to his Children*, &c. In his principles Dr. Percival was a dissenter, but he was not so averse to the episcopalian religion, as to prevent one of his children from devoting himself to the ministry of the establishment.

PERCLOSE. *s.* (*per* and *close*.) Conclusion; last part: obsolete (*Haleigh*).

To PERCOLATE. *v. a.* (*percolo*, Latin.) To strain through (*Hale*).

PERCOLATION. *s.* (from *percolate*.)

The act of straining; purification or separation by straining (*Ray*).

To PERCUSS. *v. a.* (*percussus*, Latin.) To strike (*Bacon*).

PERCUSSION. *s.* (*percussio*, Latin.) 1. The act of striking; stroke (*Newton*). 2. Effect of sound in the ear (*Rymer*).

PERCUSSION, and **COLLISION**, are nearly synonymous, both being distinguishable from the pressure by the circumstance of velocity. A body operates upon another by pressure when it is at rest (at least, as to sense) and acts by its mere weight; and when a body which is moving acts upon another body which opposes its motion, it operates upon that body by percussion.

Percussion is either direct or oblique: and it is generally considered with regard to bodies that are perfectly or imperfectly elastic, or non elastic.

Direct percussion is that in which the impulse is made in the direction of a line perpendicular at the place of impact, and which also passes through the common centre of gravity of the two striking bodies. As is the case in two spheres, when the line of the direction of the stroke passes through the centres of both spheres; for then the same line, joining their centres, passes perpendicularly through the point of impact. And

Oblique percussion is that in which the impulse is made in the direction of a line that does not pass through the common centre of gravity of the striking bodies; whether that line of direction is perpendicular to the place of impact, or not.

The force of percussion is the same as the momentum, or quantity of motion, and is represented by the product arising from the mass or quantity of matter moved, multiplied by the velocity of its motion.

The nature and laws of percussion have been investigated by Aristotle, Galileo, Des Cartes, Huygens, and others. Aristotle started the idea that percussion and weight are incomparable; and most moderns have acquiesced in that opinion. Mr. Leibnitz paid much attention to this subject; but not with great success. Conformably to his whimsical doctrine of living and dead forces, the action of gravity, or of a spring, is a *vis viva*, when it actually produces motion in the body on which it acts; but when a stone lies on a table, and presses on it, this pressure is a *vis mortua*. Its exertion is made, and in the same instant destroyed, by an opposite *vis mortua*. Each of these exertions would have produced a beginning of motion (something different from any the smallest local motion); and the sum of all would, after a certain time, have amounted to a sensible motion and velocity. There seems no distinct conception to accompany, or that can accompany, this language. And, as a proof that Leibnitz had no distinct conceptions of the matter, he has recourse to an experiment of Galileo in support of his genesis of a sensible motion from the continual exertions of the *vis mortua*; and he concludes that the force of percussion is infinitely, or incomparably, greater than pressure, because it is the sum total of an infinity of individual exertions of *vis mortua*. Nothing but the authority which Leibnitz has acquired on the continent, by the zealous efforts of his partizans, could excuse our taking up any time in considering this unintelligible discourse. Surely, if there is such a thing as a *vis viva*, it exists in the moving water in Galileo's experiment, and its impulses are not continual exertions of a *vis mortua*. Nor is it possible to conceive continual impulse, or a

PERCUSSION.

beginning of motion that is not motion, &c. &c. It is paradoxical (and Leibnitz loved to raise the wonder of his followers by paradoxes) to say that percussion is infinitely greater than pressure, when we see that pressure can do every thing that can be done by percussion. Nay, Euler, by far the most able supporter of the doctrines of Leibnitz, about the force of bodies in motion, actually compares these two forces; and, in his Commentary on Robins's Artillery, demonstrates, in his way, that when a musket ball, moving with the velocity of 1700 feet per second, penetrates five inches into a block of elm, the force of its percussion is 107,760 times its weight. John Bernoulli restricts the infinite magnitude of percussion to the case of perfectly hard bodies; and, for this reason alone, says, that there can be none such in the universe. But, as this justly celebrated mathematician scouts with scorn the notion of attractions and repulsions, he must allow, that an ultimate atom of matter is unchangeable in its form; which we take to be synonymous with saying that it is perfectly hard. What must be the result of one atom in motion hitting another at rest? Here must be an instantaneous production of a finite velocity, and an infinite percussion. A doctrine which reduces its abettors to such subterfuges, and engages the mind in such puzzling contemplations, cannot (to say the best of it) be styled an explanation of the laws of nature. The whole language on the subject is full of paradoxes and obscurities. In order to reconcile this infinite magnitude of percussion with the observed finite magnitude of its effects, they say that the pressure, or instantaneous effort, has the same relation to the force of percussion that an element has to its integral; and in maintaining this assertion, they continually consider this integral under the express denomination of a sum total, robbing Leibnitz's great discovery of the infinitesimal calculus of every superiority that it possessed over Wallis's Arithmetic of Infinites, and really employing all the erroneous practices of the method of indivisibles. We look upon the strange things which have been inculcated, with pertinacious zeal, in this doctrine of percussion and *vires vices*, as the most remarkable example of the errors into which the unguarded use of Cavalieri's Indivisibles, and of the Leibnitzian notion of the infinitesimal calculus, have led eminent mathematicians. It is not true that the pressure, and the ultimate force of percussion, have this relation; nor has the pressure and the resulting motion, which is mistaken for the measure of this ultimate force, any mathematical relation whatever. The relation is purely physical; it is the relation of pure cause and effect; and all that we know of it is their constant conjunction. The relation of fluxion and fluent is not a mathematical or measurable relation, but a connection in thought; which is sufficient for making the one an indication of the other, and the measures of the proportions of the one a mean for obtaining a measure of the proportions of the other. In this point of view, the relation of pressure to motion, as the measure of the force of percussion, resembles that of fluxion and fluent, but is not the same.

Much has been said by the partizans of Mr. Leibnitz about the incomparableness of pressure and percussion, and many experimental proofs have been adduced of the incomparable superiority of the latter. Bulfinger says, that the pressure of many tons will not cause a spike to penetrate a block of hard oak half so far as it may be driven by a weak man with one blow of a mallet; and that a

moderate blow with a small hammer will shiver to powder a diamond, which would carry a mountain without being hurt by its pressure. Nay, even Mr. Camus, of the Academy of Paris, a staunch Cartesian, and an eminent mechanician, says that he beat a leaden bullet quite flat with a hammer of one pound weight, without much force; and that he found that 200 pounds weight would not have flattened it more than this blow: and he concludes from thence, that the force of the blow exceeded 200 pounds. These, to be sure, are remarkable facts, and justify a more minute consideration of a power of producing certain effects, which is so frequently and so usefully employed. But, at the same time, these are all such very vague expressions, and they do not authorise any precise conclusions from them. Mr. Camus saying "without much force," makes his pound weight, and his 200 pound weight, of no use for determining the force of the blow. He would have given more precise and applicable data for his decision, had he told us from what height the hammer should fall in order to flatten the bullet to this degree. But even then we should not have obtained any notion of the force in actual exertion during the flattening of the bullet; for the blow which could flatten the bullet in a longer or a shorter time, would unquestionably have been less or greater.

All the paradoxes, obscurities, and puzzling difficulties, in this subject, disappear, if we leave out of our consideration that unintelligible force, which is supposed to preserve a body in motion or at rest; and if we consider both of these states of body as conditions which will continue, unless some adequate cause operate a change; and if we farther grant, that such causes do really exist in the universe, however unknown their nature may be by us; and, lastly, if we acknowledge, that the phenomena of elasticity, expansiveness, cohesion, gravity, magnetism, electricity, are indications of the agency of such causes, and that their actual exertions, and the motions and changes consequent on these exertions, are so invariably connected with particular bodies, that they always accompany their appearance in certain mutual relations of distance and position:—if we proceed thus, all the phenomena of collision will be explained by these causes alone, without supposing the existence and agency of a cause distinct from them all, and incomparable with them, called the force of percussion.

For it has been sufficiently demonstrated, that that property of tangible coherent matter, which we call perfect elasticity, operates as a pressure during a certain small portion of time on both bodies, diminishing more and more the motion of the one, and augmenting that of the other, as the compression of one or both increases, till at last they separate with sensible velocities. In some very simple or perspicuous cases, we know what this pressure is in every instant of the action. We can tell how many pounds weight, at rest, will exert the same pressure. We can tell the whole duration of this pressure, and the space along which it is exerted; and, in such a case, we can say with precision what motion will be generated by this continued and varied pressure on the body which was at rest, and what diminution will be made in the motion of the other. All this can be done in the case of a ball A (fig. 7, pl. 133) moving like a pendulum with a small velocity, and striking a slender elastic hoop B, also suspended like a pendulum. We can ascertain by experiment before the collision, what pressure is neces-

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nary for compressing it one inch, one-half, one-fourth, &c. Knowing this and the weight of the hoop, and the weight and velocity of the ball, we can tell every circumstance of the collision; how long the compression continues; what is the greatest compression; how far the bodies have moved while they were acting on each other; and what will be the final motion of each: in short, every thing that affords any mark or measure of a force of percussion. And we know that all this is produced by a force, familiarly known to us by the name of elasticity. Which of all these circumstances shall be called the percussion, or the force of percussion? Is it the ultimate or greatest pressure occasioned by the compression? This cannot be, because this alone will not be proportional to the final change of motion, which is generally taken as a measure of the percussion when a change of motion is its only observed effect.

We know that another perfectly elastic body, of the same weight, and struck by the same blow, and acquiring the same final velocity by the stroke, may not have sustained the tenth part of the pressure, in any one instant of the collision, if it has only been much more compressible. The greatest mutual pressure in the collision of a billiard ball is perhaps 1000 times greater than it is in a similar collision of a foot-ball of the same weight.

We also know what degree of compression will break this hoop, and what pressure will produce this compression. Therefore, should the fracture of the body be considered as the mark and measure of the percussion, we know what blow will just produce it, and be exhausted by so doing. In short, we know every mark and measure of percussion which this hoop can exhibit.

We can increase the strength of this hoop till it becomes a solid disk; and we see clearly, that in all these forms the mode of acting is the same. We see clearly, that it is the same when, instead of the solid disk, it is an elastic ball; therefore every thing that can indicate or measure the percussion of an elastic ball is explained without the operation of a peculiar force of percussion, even when the ball is shivered to pieces by the blow.

Nor is the case materially different when the bodies are soft, or imperfectly elastic. When the struck body is uniformly tenacious, it opposes a uniform resistance to penetration, and its motion will be uniformly accelerated by the action of its own tenacity during the whole time of mutual action, except a trifling variation occasioned by the mere motion of the internal parts, independent of their tenacity. If we know the weight necessary for merely penetrating this mass, and the weight and velocity of the penetrating body, we can tell how long it must be resisted by this force before its initial velocity will be annihilated, and therefore how far it will penetrate. We have tried this with deal, birch, willow, and other soft woods of uniform texture, and with nails having the body somewhat slenderer than the end, that there might not be an irregularity occasioned by a friction on the sides of the nail, continually increasing as the penetration advanced. We made the hammer fall from a considerable height, and hit the nail with great accuracy in the direction of its length, by fixing it to the end of a long lath, moveable round an axis. The results corresponded with the calculation with all the precision that could be desired.

But it does not result from all this agreement, that the force, exertion, or effect, of a blow with a hammer is equal to the pressure of any number

of pounds whatever. They are things that cannot be compared; and yet the force operating in the penetration by a blow is no way different from a pressure. It is a physical blunder to compare the area of the curve, whose abscissa is the depth of penetration, and the ordinates are as the resistances, with any pressure whatever. This area expresses the square of a velocity, and its slips, bounded by parallel ordinates indefinitely near each other, are as the decrements of this square of a velocity, occasioned by a pressure, acting almost uniformly along a very small space, or during a very small time. It is an absurdity therefore to sum up these slips as so many pressures, and to consider the sum total as capable of expressing any weight whatever. Such a paralogism is peculiar to Leibnitz's way of conceiving his infinitesimal method, and it could have no place in the genuine method of fluxions. It is this misconception that has made Mr. Leibnitz and his followers suppose that a body, accelerated by gravity, retains in it a sum total of all the pressures of gravity accumulated during its fall, and now forming a *vis viva*. Supposing that it requires a pressure of twenty pounds to press a six pound shot slowly through a mass of uniformly resisting clay; this pressure would carry it from the top to the bottom of a mountain of such clay. Yet this ball, if discharged horizontally from a cannon, would penetrate only a few yards, even though the clay should resist by tenacity only, independent of the motion lost by giving motion to its internal parts. In this experiment, the utmost pressure exerted during the motion of the ball did not much exceed the pressure of twenty pounds. In this comparison, therefore, percussion, so far from appearing infinitely greater than pressure, would appear much less. But there is perhaps no body that resists penetration with perfect uniformity, even though uniformly tenacious. When the ball has penetrated to some depth, the particles which are before it cannot be so easily displaced, even although they had no tenacity, because the particles adjoining are more hemmed in by those beyond them. We have always observed, that a ball impelled by gunpowder through water rises toward the surface (having entered horizontally through the side of the vessel at some depth), and this so much the more rapidly as it entered nearer to the surface. The reason is plain. The particles which must be displaced before the ball, escape more easily upwards than in any other direction. It is for this reason chiefly that a greater weight laid on the head of a nail will cause it to sink deeper into the wood; and thus a great weight appears to be commensurable with a great force of percussion. Also while a bullet is flattening more and more under a hammer during the progress of a blow, it is spreading under the hammer; more particles are resisting at once, and they find more difficulty in effecting their escape, being harder squeezed between the hammer and the anvil. The same increased resistance must obtain while it is flattening more and more under the quiet pressure of a weight; and thus, too, a greater weight appears to be commensurable with a greater blow.

After all, however, it is true, notwithstanding that a blow given by a falling body must excite a pressure greater than its mere weight can do, and this in any degree. Thus, suppose A B (fig. 8) to represent a spiral spring in its natural unconstrained dimensions, standing upright on a table. Let a b , be the abscissa of a line a d h k , whose ordinates e d , g h , i k , &c. are as the elastic reaction of the

spring when it is compressed into the lengths $c\delta$, $g\delta$, $i\delta$, &c. Suppose that, when it is compressed into the form CD , it will just support the weight of a ball lying on C . Then cd will be a reaction equal to the weight of the ball, and the rectangle $acdf$ will express the square of the velocity which this ball would acquire by falling freely through ac . If therefore the ball be gently laid on the top of the spring at A , and then let go, it will descend, compressing the spring. It will not stop when the spring has acquired the form CD , which enabled it to carry the weight of the ball gently laid on it. For in this situation it has acquired a velocity, of which the square is represented by the figure $adef$. It will compress the spring into the length $g\delta$, such that the area $cghd$ is equal to the area $adef$. If the ball instead of being gently laid on A , be dropped from M , it will compress the spring into such a length $i\delta$, that the area, ak is equal to the rectangle $mcdn$; and, if the spring cannot bear so great compression, it will be broken by this very moderate fall.

Thus we see that a blow may do things which a considerable pressure cannot accomplish. The accounts which are given of these remarkable effects of percussion, with the view of impressing notions of its great efficacy, are generally in very indefinite terms, and often without mentioning circumstances which are accessory to the effect. It would be very unfair to conclude an almost infinite power of percussion, from observing, that a particle of sand, dropped into a thick glass bottle which has not been annealed, will shiver it to pieces. When Mr. Bulfinger says that a moderate blow will break a diamond which would carry a mountain, he not only says a thing of which he cannot demonstrate the truth, and which, in all probability, is not true; but he omits noticing a circumstance which he was mechanician enough to know would have a considerable share in the effect. We mean the rapidity with which the excited pressure increases to its maximum in the case of a blow. In the experiment in question, this happens in less than the millionth part of a second, if the velocity of the hammer has been such as a man would generate in it by a very moderate exertion. For the blow which will drive a good lath nail to the head in a piece of soft deal with an ordinary carpenter's hammer, must be accounted moderate. This we have learned by experiment to be above 25 feet per second. The connecting forces exerted between the particles of the diamond may not have time sufficient for their excitation in the remote parts, so as to share the derangement among them all, in such a manner that it may be so moderate in each, as not to amount to a disunion in any part of the diamond. We see many instances of this in the abrupt handling of bodies of tender and friable texture. It is partly owing to this that a ball discharged from a pistol will go through a sheet of paper standing on edge without throwing it down, which it would certainly do if thrown at it by the hand. The connecting forces, having time to act in this last case, drag the other parts of the paper along with them, and their union is preserved. Also, when a great weight is laid on the diamond, it is gradually dimpled by it; and thus inclosing many parts together in the dimple, it obliges them to act in concert, and the derangement of each is thus diminished.

We flatter ourselves that the preceding observations and reflections will contribute somewhat towards removing the paradoxes and mysteries

which discredit, in some degree, our mechanical science. If we will not pertinaciously conjure up ideal phantoms, which, perhaps, cannot exist, but content ourselves with the study of that tangible matter which the Author of Nature has presented to our view, we shall have abundant employment, and shall perceive a beautiful harmony thro' the whole of natural operations; and we shall gradually discover more and more of those mutual adaptations which enable an atom of matter, although of the same precise nature wherever it is found, to act such an unspeakable variety of parts, according to the diversity of its situations and the scene on which it is placed. If a mind be "not captivated by the harmony of such sweet sounds," we may pronounce it "dark as Erebus, and not to be trusted." (*Sup. Ency. Britan.*)

It is a celebrated proposition of Bernoulli, that in the percussion or collision of perfectly elastic bodies the sum of the products formed by multiplying each body into the square of its velocity is not altered by the impact. And Mr. Atwood has shewn that if in any system of bodies, the elastic force be to that which causes the change of figure as 854 to 1000, the sum of the products formed by multiplying each body into the cube of its velocity, will be the same before and after the impact. See his Analysis of a Course of Lectures, page 45, where he gives the investigation generally for any power of the velocity.

Don George Juan, a celebrated Spanish author, has given a new physico-mathematical theory of percussion; for an account of which we must refer to Gregory's Mechanics, vol. i. p. 291, 313.

PERCUSSION (Centre of). See CENTRE.

PERCU'TIENT. *s.* (*percultiens*, Latin.) Striking; having the power to strike (*Bacon*).

PERDENDOSI, in music. An Italian compound signifying that the passage over which it is written is to be performed in a time gradually decreasing to the last note, and with a tone insensibly sinking on the ear till entirely lost.

PERDICUM, in botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; down simple; florets two-lipped. Twelve species; a few of the Cape, the rest of South America.

PERDITION. *s.* (*perditio*, Latin.) 1. Destruction; ruin; death (*Bacon*). 2. Loss (*Shakspeare*). 3. Eternal death (*Raleigh*).

PERDIX. See TETRAO.

PERDUE. *ad.* Closely; in ambush (*Hud.*). PERDULOUS. *a.* (from *perdo*, Latin.) Lost; thrown away (*Bramhall*).

PERDURABLE. *a.* (*perdurable*, Fr.) Lasting; long continued: not in use (*Shaks.*).

PERDURABLY. *ad.* (from *perdurable*.) Lastingly (*Shakspeare*).

PERDURATION. *s.* (*perduro*, Latin.) Long continuance (*Ainsworth*).

PERECZAS, a town of Upper Hungary, capital of a county of the same name, 50 miles E. by N. of Tockay. Lon. 22. 26 E. Lat. 48. 30 N.

PEREGAL. *a.* (French.) Equal: obsolete (*Spenser*).

To PEREGRINATE. *v. n.* (*peregrinus*, Latin) To travel; to live in foreign countries.

PEREGRINATION. *s.* (from *peregrinus*,

Latin.) Travel; abode in foreign countries (*Bentley*).

PEREGRINE. *a.* (*peregrinus*, Latin.) Foreign; not native; not domestic (*Bacon*).

To PEREMPT. *v. a.* (*peremptus*, Latin.) To kill; to crush. A law term (*Ayliffe*).

PEREMPTION. *s.* (*peremptio*, Latin; *peremption*, French.) Crush; extinction. Law term.

PEREMPTORIALLY. *ad.* (from *peremptory*.) Absolutely; positively; so as to cut off all further debate (*Clarendon*).

PEREMPTORINESS. *s.* (from *peremptory*.) Positiveness; absolute decision; dogmatism (*Gov. of the Tongue*).

PEREMPTORY. *a.* (*peremptorius*, low Latin.) Dogmatical; absolute; such as destroys all further expostulation (*South*).

PERENNIAL. *a.* (*perennis*, Latin.) 1. Lasting through the year (*Cheyne*). 2. Perpetual; unceasing (*Harvey*).

PERENNITY. *s.* (from *perennitas*, Lat.) Equality of lasting through all seasons; perpetuity (*Derham*).

PERFECT. *a.* (*perfectus*, Latin; *parfait*, French.) 1. Complete; consummate; finished; neither defective nor redundant (*Hooker*). 2. Fully informed; fully skilful (*Shakspeare*). 3. Pure; blameless; clear; immaculate (*Sh.*). 4. Confident; certain (*Shakspeare*).

PERFECT FLOWER, in botany, having both stamen and pistil; or at least anther and stigma: the same therefore with hermaphrodite. Delin. Pl. In Philos. Botan. it is synonymous with petalodes of Tournefort. But the having a corol only is by no means sufficient to constitute perfection in a flower, according to Linnæus's idea: neither does the want of it argue imperfection.

PERFECT NUMBER, is one that is equal to the sum of all its aliquot parts when added together. Eucl. lib. 7, def. 22. As the number 6, which is $1 + 2 + 3$, the sum of all its aliquot parts; also 28, for $28 = 1 + 2 + 4 + 7 + 14$, the sum of all its aliquot parts. It is proved by Euclid, in the last prop. of book the 9th, that if the common geometrical series of numbers 1, 2, 4, 8, 16, 32, &c. be continued to such a number of terms, as that the sum of the said series of terms shall be a prime number, then the product of this sum by the last term of the series will be a perfect number. The first eight perfect numbers are as follow, with the factors and products which produce them:

The first perfect numbers.	Their values.
6	$= (2^2 - 1) 2$
28	$= (2^3 - 1) 2^2$
496	$= (2^5 - 1) 2^4$
8128	$= (2^7 - 1) 2^6$
33550336	$= (2^{13} - 1) 2^{12}$
8589869056	$= (2^{17} - 1) 2^{16}$
137438691328	$= (2^{19} - 1) 2^{18}$
2305843008139952128	$= (2^{31} - 1) 2^{30}$

See several considerable tracts on the subject of Perfect Numbers, in the Memoirs of the Petersburg Academy, vol. 2 of the new vols, and in several other volumes. See also

Barlow's Treatise on the Properties of Numbers.

To PERFECT. *v. a.* (*perfectus*, from *perficio*, Latin; *parfaire*, French.) 1. To finish; to complete; to consummate; to bring to its due state (*Waller*). 2. To make skilful; to instruct fully (*Shakspeare*).

PERFECTER. *s.* (from *perfect*.) One that makes perfect (*Pope*).

PERFECTION. *s.* (*perfectio*, Latin; *perfection*, French.) 1. The state of being perfect (*Milton*). 2. Something that concurs to produce supreme excellence (*Dryden*). 3. Attribute of God (*Atterbury*).

To PERFECTIONATE. *v. a.* (*perfectionner*, Fr.) To make perfect; to advance to perfection: not used (*Dryden*).

PERFECTIVE. *a.* (from *perfect*.) Conducing to bring to perfection (*Ray*).

PERFECTIVELY. *ad.* In such a manner as brings to perfection (*Grew*).

PERFECTLY. *ad.* (from *perfect*.) 1. In the highest degree of excellence. 2. Totally; completely (*Boyle*). 3. Exactly; accurately (*Locke*).

PERFECTNESS. *s.* (from *perfect*.) 1. Completeness; perfection. 2. Goodness; virtue (*Colossians*). 3. Skill (*Shakspeare*).

PERFIDIOUS. *a.* (*perfidus*, Latin; *perfid*, French.) 1. Treacherous; false to trust; guilty of violated faith (*Widow and Cat*). 2. Expressing treachery; proceeding from treachery (*Milton*).

PERFIDIOUSLY. *ad.* Treacherously; by breach of faith (*Hudibras*).

PERFIDIOUSNESS. *s.* (from *perfidious*.) The quality of being perfidious (*Tillotson*).

PERFIDY. *s.* (*perfidia*, Latin; *perfidie*, French.) Treachery; want of faith; breach of faith.

PERFLABLE. *a.* (from *perflo*, Latin.) Having the wind driven through.

To PERFLATE. *v. a.* (*perflo*, Latin.) To blow through (*Arbuthnot*).

PERFLATION. *s.* (from *perflate*.) The act of blowing through (*Woodward*).

PERFOLIATE LEAF. In botany, a perforated leaf. Si basis folii undique cingat transversim caulem. Philos. Bot. Basi transversim cingente (nec antice dehiscente) caulem. Having the base of the leaf entirely surrounding the stem transversely (without any opening in front). The latter clause of this explanation added in Delin. Pl. is not absolutely necessary to discriminate this from the stem-clasping leaf (amplexicaule); if the terms of the two explanations in Philos. Bot. be carefully attended to. The base of that is said to surround the sides of the stem; whereas in this, the base encircles it quite round; so that it seems as if the stem had been driven through the middle of the leaf. The perfoliate leaf is well exemplified in *bupleurum rotundifolium*.

After all, *folium perfoliatum* is perhaps an improper term, and should rather be *caulis perfoliatus*, a perfoliate stem.

PERFOLIATA. (from *per* and *folium*, so

called because the leaves surround the stem, like those of the cabbage.) Round-leaved hare's ear, or theroow wax. This plant, *bupleurum rotundifolium* of Linnéus, was formerly celebrated for curing ruptures, mixed into a poultice with wine and oatmeal. See *BUPLEURUM*.

PERFORANS. See *FLEXOR PROFUNDUS PERFORANS*.

PERFORATE LEAF, in botany. Full of small holes, very apparent when held up to the light. As in *hypericum*.

If there be any difference of meaning in the three terms perforate, pertuse, punctate; the first may be rendered pierced, the second punched, and the third dotted. In Delin. Pl. they are set down as synonymous, and are explained to be, *adspersa punctis excavatis*: that is, having hollow dots scattered over the surface. In Philos. Bot. we find only the term *punctatum* explained in the same manner. There also (p. 211.) mention is made of leaves that are dotted underneath; as in *anagallis* and *plantago maritima*.

The term perforate is applied also to a stigma having a hole bored through it.

PERFORATUS, in anatomy. See *FLEXOR BREVIS DIGITORUM PEDIS*, and *FLEXOR SUBLIMIS PERFORATUS*.

To PERFORATE. *v. a.* (*perforo*, Lat.) To pierce with a tool; to bore (*Blackmore*).

PERFORATION. *s.* (from *perforate*.) 1. The act of piercing or boring (*More*). 2. Hole; place bored (*Ray*).

PERFORATOR. *s.* (from *perforate*.) The instrument of boring (*Sharp*).

PERFORCE. *ad.* (*per* and *force*.) By violence; violently (*Shakspeare*).

To PERFORM. *v. a.* (*performare*, Ital.) To execute; to do; to discharge; to achieve an undertaking; to accomplish (*Sidney*).

To PERFORM. *v. n.* To succeed in an attempt (*Watts*).

PERFORMABLE. *a.* (from *perform*.) Practicable; such as may be done (*Brown*).

PERFORMANCE. *s.* (from *perform*.) 1. Completion of something designed; execution of something promised (*South*). 2. Composition; work (*Dryden*). 3. Action; something done (*Shakspeare*).

PERFORMER. *s.* (from *perform*.) 1. One that performs any thing (*Shakspeare*). 2. It is generally applied to one that makes a public exhibition of his skill.

To PERFRICATE. *v. n.* (*perfrico*, Lat.) To rub over.

PERFUMATORY. *a.* (from *perfume*.) That does perfume.

PERFUME. *s.* (*parfume*, French.) 1. Strong odour of sweetness used to give scents to other things (*Bacon*). 2. Sweet odour; fragrance (*Pope*).

To PERFUME. *v. a.* (from the noun.) To scent; to impregnate with sweet scent (*Pope*).

PERFUMER. *s.* (from *perfume*.) One whose trade is to sell things made to gratify the scent.

PERFUNCTORILY. *ad.* (*perfunctorie*,

Latin.) Carelessly; negligently; in such a manner as to satisfy external form (*Clar.*).

PERFUNCTORY. *a.* (*perfunctorie*, Lat.) Slight; careless; negligent (*Woodward*).

To PERFUSE. *v. a.* (*perfusus*, Latin.) To tincture; to overspread (*Harvey*).

PERGA, a town of Turkey in Europe, in Albania, opposite the island of Corfu. Lon. 20. 19 E. Lat. 39. 40 N.

PERGAMAR, a town of Turkey in Europe, in Romania, with a bishop's see; 60 miles S.W. of Adrianople, and 65 N.W. of Gallipoli. Lon. 25. 55 E. Lat. 41. 10 N.

PERGAMO, an ancient town of Natolia, with a bishop's see, a palace, and a castle. It is not so considerable as formerly, but has nine mosques, and occupies an oblong circumference of three miles, at the foot of a mountain. Here parchment was invented. It is seated on the Germasti, 15 miles from its mouth, and 37 N. of Smyrna. Lon. 27. 27 E. Lat. 39. 5 N.

PERGAMUS, the citadel of the city of Troy. The word is often used for Troy. It was situated in the most elevated part of the town, on the shores of the river Scamander.

PERGAMUS, a town of Mysia, on the banks of the Caycus. It was the capital of a celebrated empire called the kingdom of Pergamus, founded by Philæterus, an eunuch, whom Lysimachus, after the battle of Ipsus, had entrusted with the treasures he had obtained in the war. Philæterus made himself master of the treasures, and of Pergamus, in which they were deposited, B. C. 283, and laid the foundation of an empire, over which he himself presided for 20 years. His successors were Eumenes, Attalus, Eumenes the second, Attalus Philadelphus, and Attalus Philomator, 138, who, B. C. 133, left the Roman people heirs to his kingdom, as he had no children. Parchment was first invented and made use of at Pergamus to transcribe books, as Ptolemy, king of Egypt, had forbidden the exportation of papyrus from his kingdom. From this circumstance parchment has been called *charta pergamena*. Galenus the physician, and Apollodorus the mythologist, were born there. Æsculapius was the chief deity of the country.

PERGULARIA, in botany, a genus of the class pentandria, order digynia. Corol twisted, salver-shaped; nectary surrounding the parts of fructification, with five arrow-shaped points. Five species; horning plants of India and the Cape.

PERGUNNAH, in the language of Hindustan, means the largest subdivision of a province, whereof the revenues are brought to one particular head cutchery, from whence the accounts and cash are transmitted to the general cutchery of the province.

PERHAPS. *ad.* (*per* and *hap.*) Peradventure; it may be (*Smith*).

PERIA, a town of Persia, in the province of Irac, 90 miles W. of Ispahan. Lon. 51. 25 E. Lat. 32. 20 N.

PERIAC, a town of France, in the depart-

ment of Aude, celebrated for its salt-works, six miles S.W. of Narbonne.

PERIANDER. (περιανδρ., a tyrant of Corinth, son of Cypselus. The first years of his government were popular. Having consulted the tyrant of Sicily respecting the manner in which he ought to govern, he received no other answer but whatever explanation he wished to place on the tyrant's having, in the presence of his messenger, plucked in a field all the ears of corn which seemed to tower above the rest. Periander understood the meaning of this answer. He immediately put to death the richest and most powerful citizens of Corinth. He was not only cruel to his subjects, but even his family were objects of his vengeance. He committed incest with his mother, and put to death his wife Melissa, upon false accusation. He also banished his son Lycophron to the island of Corcyra, because the youth pitied the miserable end of his mother. Periander died about 585 years before the Christian era, and by the meanness of his flatterers, he was reckoned one of the seven wise men of Greece.

PERIANTH. (περιανθ., about, and ανθος, a flower.) In botany, the calyx of a flower when contiguous to the other parts of fructification. Calyx fructificatione contiguus. In Regn. Veget. it is corollæ approximatum: but it frequently happens that a flower has a perianth without any corol. The perianth is often, but improperly, called the calyx exclusively; for this latter term has a more extensive signification. See CALYX.

Perianth of the fructification includes the stamens and germ.

Perianth of the flower contains the stamens without the germ.

Perianth of the fruit contains the germ without the stamens.

For the difference between perianth and bracte, see BRACTE.

PERIAPATAM, a town of the peninsula of Hindustan, 24 miles S.W. of Seringapatam, and 54 N.E. of Tellicherry. Lon. 76. 31 E. Lat. 12. 15 N.

PERIAPT. s. (περιαπτω.) Amulet; charm worn as preservative against diseases or mischief (*Shakspeare*).

PERIBLEPSIS. (περιβλεψις, from περιβλεπω, to stare about.) In medicine, that kind of wild look which is observed in delirious persons.

PERIBROSIS. (περιβρωσις.) An ulceration or erosion at the corners or uniting parts of the eyelids. This disorder most frequently affects the internal commissura of the eyelids. The species are, 1. Peribrosis, from the acrimony of the tears, as may be observed in the epiphora. 2. Peribrosis, from an ægylops, which sometimes extends to the commissura of the eyelids.

PERICARDITIS. (περικαρδιτις, from περικαρδιον, the pericardium.) Inflammation of the pericardium.

PERICARDIUM. (περικαρδιον, from περι, about, and καρδια, the heart.) The membranaceous bag that surrounds the heart. Its use is

to secrete and contain the vapour of the pericardium, which lubricates the heart, and thus preserves it from concreting with the pericardium.

PERICARPI. (περι, and καρπος, fruit or seed.) In botany, a seed-vessel or seed-case. Viscus gravidum seminibus, quæ matura dimittit. Vasculum semina producens dimittensque. Ovarium fœcundatum. Philos. Bot. 52, 56, 92. Germen defloratum seminiferum. Regn. Veg. A viscus big with seeds, or a vessel producing seeds, which it lets drop when they are ripe. Or it may be considered as the ovary or germ fecundated, or arrived to a state of maturity, after the flower is past; containing ripe seeds analogous to fruitful eggs.

The most remarkable pericarps are the capsule, silique, legume, follicle, drupe, berry, strobile.

PERICHÆTIUM. (περι, and χαιτη, juba.) In botany. Involucrum setosum, quod inter foliola basin cingit. A bristly involucre, surrounding the base, among the leaflets: in mosses.

PERICHONDRIUM. (περιχονδριον, from περι, about, and χονδριον, a cartilage.) The membrane that covers a cartilage.

PERICLES, an Athenian of a noble family, son of Xanthippus and Agariste. He, by attending the lectures of Damon, Zeno, and Anaxagoras, became a commander, a statesman, and an orator. He rendered himself popular by opposing Cimon, the favourite of the nobility, and to remove every obstacle which stood in the way of his ambition, he lessened the dignity of the court of the Areopagus. He also attacked Cimon, and caused him to be banished by the ostracism. Thucydides also, who had succeeded Cimon, shared the same fate, and Pericles remained for 15 years the absolute sovereign of the republic. Pericles did not enrich himself, but the prosperity of Athens was the object of his administration. He made war against the Lacedæmonians, and restored the temple of Delphi to the care of the Phocians. He obtained a victory over the Sicyonians near Nemæa, and waged a successful war against the inhabitants of Samos at the request of his favourite mistress Aspasia. (See ASPASTA.) The Peloponnesian war was fomented by his ambitious views (see PELOPONNESIACUM BELLUM), and when he had warmly represented the flourishing state of his country, the Athenians undertook a war against the most powerful republics of Greece, which was concluded by the destruction of their empire, and the demolition of their walls. The Athenians were at first successful, but an unfortunate expedition raised clamours against Pericles, and he was condemned to pay fifty talents, but he was again restored to all his honours, and if possible invested with more authority than before. The dreadful pestilence, however, which had diminished the number of his family, proved fatal to him, and about 420 years before Christ, in his 70th year, he fell a sacrifice to that terri-

ble malady, which robbed Athens of so many citizens. Pericles was for 40 years at the head of the administration, 25 years with others, and 15 alone. As he was expiring, and seemingly senseless, his friends that stood around his bed expatiated with warmth on the most glorious actions of his life, and the victories which he had won, when he suddenly interrupted their tears and conversation, by saying that in mentioning the exploits that he had achieved, and which were common to him with all generals, they had forgot to mention a circumstance which reflected far greater glory upon him as a minister, a general, and above all as a man. The Athenians were so pleased with his eloquence that they compared it to thunder and lightning, and as to another father of the gods, they gave him the surname of Olympian. However great and venerable his character may be, his vicious partiality for the celebrated courtesan Aspasia justly subjected him to the ridicule and the censure of his fellow citizens.

PERICLITATION. *s.* (from *periclitor*, Latin.) 1. The state of being in danger. 2. Trial; experiment.

PERICONIA, in botany, a genus of the class cryptogamia, order fungi. Fungus globular; seeds sessile, deciduous, every where clothing the head and stem: one species only, an exotic liver-wort-like fungus.

PERICRANIUM. (*περικρανιον*, from *περι*, and *κρανιον*, the cranium.) The membrane that is closely connected to the bones of the head.

PERICULOUS. *a.* (*periculosus*, Latin.) Dangerous; jeopardous; hazardous (*Brown*).

PERIERGY. *s.* (*περι* and *εργον*.) Needless caution in an operation; unnecessary diligence.

PERIGÆUM, or **PERIGEE**, is that point of the orbit of the sun or moon, which is the nearest to the earth. In which sense it stands opposed to Apogé, which is the most distant point from the earth.

PERIGEE, in the ancient astronomy, denotes a point in a planet's orbit, where the centre of its epicycle is at the least distance from the earth.

PERIGÉUX, an ancient town of France, capital of the department of Dordogne and late province of Perigord, with a bishop's see, the ruins of a temple of Venus, and an amphitheatre. It is seated on the river Isle, 50 miles S.W. of Limoges. Lon. O. 48 E. Lat. 45. 11 N.

PERIGORD, a late province of France, 83 miles long and 60 broad; bounded on the N. by Angoumois and Marche, on the E. by Quierci and Limosin, on the S. by Agenois and Bazadois, and on the W. by Bourdelois, Angoumois, and Santonge. It abounds in iron-mines, and the air is pure and healthy. It now forms the department of Dordogne.

PERIGORD STONE. In mineralogy. See **MAGNESIUM**.

PERIHELION, **PERIHELIUM**, that point in the orbit of a planet or comet which is

nearest to the sun. In which sense it stands opposed to Aphelion, or Aphelium, which is the highest or most distant point from the sun.

Instead of this term, the ancients used *perigeum*; because they placed the earth in the centre.

PERIL. *s.* (*peril*, Fr. *perikel*, Dutch.) 1. Danger; hazard; jeopardy (*Daniel*). 2. Denunciation; danger denounced (*Shakspeare*).

PERILLA. In botany, a genus of the class didynamia, order gymnospermia. Calyx with the upper division very short; stamens distant; styles two, united. One species; an annual of India.

PERILLUS, an ingenious artist at Athens, who made a brazen bull for Phalaris, tyrant of Agrigentum. This machine was fabricated to put criminals to death by burning them alive, and it was such that their cries were like the roaring of a bull. When Perillus gave it to Phalaris, the tyrant made the first experiment upon the donor.

PERILOUS. *a.* (*perileux*, Fr. from *peril*.) 1. Dangerous; hazardous; full of danger. 2. It is used by way of emphasis; or ludicrous exaggeration of any thing bad (*Hudibras*). 3. Smart; witty; parlous (*Shakspeare*).

PERILOUSLY. *ad.* Dangerously.

PERILOUSNESS. *s.* Dangerousness.

PERIMETER. *s.* (*μερι* and *μετρεω*.) The compass or sum of all the sides which bound any figure, whether rectilinear or mixed. In circular figures, the equivalent words are circumference and periphery; the latter is also applied to ellipses.

PERINÆUS TRANSVERSUS. In myology. See **TRANSVERSUS PERINCI**.

PERINÆUM. (from *περινω*, to flow round, because that part is generally moist.) The space between the anus and organs of generation.

PERIOD. *s.* (*periode*, Fr. *περιδογ*.) 1. A circuit. 2. Time in which any thing is performed, so as to begin again in the same manner (*Watts*). 3. A stated number of years; a round of time, at the end of which the things comprised within the calculation shall return to the state in which they were at the beginning (*Holder*). 4. The end or conclusion (*Addison*). 5. The state at which any thing terminates (*Suckling*). 6. Length of duration (*Bacon*). 7. A complete sentence from one full stop to another (*Ben Jonson*). 8. A course of transactions memorably terminated: as, the periods of an empire.

To PERIOD. *v. a.* (from the noun.) *To* put an end to. A bad word (*Shakspeare*).

PERIOD. In astronomy, the time in which a star or planet makes one revolution, or returns again to the same point in the heavens.

There is a wonderful harmony between the distances of the planets from the sun, and their periods round him; the great law of which is, that the squares of the periodic times are always proportional to the cubes of their mean distances from the sun.

The periods, both tropical and sidereal,

with the proportions of the mean distances from the several planets, are already given in our treatise on astronomy.

PERIOD, in chronology, a revolution of a certain number of years. Of these different nations and persons have adopted various. As, **PERIOD** (Calippic), a cycle of seventy-six years.

PERIOD (Dionysian). See **VICTORIAN PERIOD**.

PERIOD (Hipparchus's), is a series or cycle of 304 solar years, returning in a constant round, and restoring the new and full moons to the same day of the solar year; as Hipparchus thought.

This period arises by multiplying the Calippic period by 4. Hipparchus assumed the quantity of the solar year to be 365d. 5h. 55m. 12 sec. and hence he concluded, that in 304 years Calippus's period would err a whole day. He therefore multiplied the period by 4, and from the product cast away an entire day. But even this does not restore the new and full moons to the same day throughout the whole period: but they are sometimes anticipated 1 d. 8 h. 23 m. 29 sec. 20 thirds.

PERIOD (Julian), so called as being adapted to the Julian year, is a series of 7980 Julian years; arising from the multiplications of the cycles of the sun, moon, and indiction together, or the numbers 28, 19, 15; commencing on the first day of January in the 764th Julian year before the creation, and therefore is not yet completed. This comprehends all other cycles, periods, and epochs, with the times of all memorable actions and histories; and therefore it is not only the most general, but the most useful of all periods in chronology.

As every year of the Julian period has its particular solar, lunar, and indiction cycles, and no two years in it can have all these three cycles the same, every year of this period becomes accurately distinguished from another.

This period was invented by Joseph Scaliger, as containing all the other epochs, to facilitate the reduction of the years of one given epoch to those of another. It agrees with the Constantinopolitan period, used by the Greeks, except in this, that the cycles of the sun, moon, and indiction, are reckoned differently; and also in that the first year of the Constantinopolitan period differs from that of the Julian period.

PERIOD (Metonic). See **CYCLE OF THE MOON**.

PERIOD (Victorian), an interval of 532 Julian years; at the end of which, the new and full moons return again on the same day of the Julian year, according to the opinion of the inventor Victorinus, or Victorius, who lived in the time of pope Hilary.

Some ascribe this period to Dionysius Exiguus, and hence they call it the Dionysian period: others again call it the great paschal cycle, because it was invented for computing the time of Easter.

The Victorian period is produced by multiplying the solar cycle 28 by the lunar cycle 19, the product being 532. But neither does this restore the new and full moons to the same day

throughout its whole duration, by 1 d. 16 h. 58 m. 59 s. 40 thirds.

PERIODICAL. **PERIODIC**. *a.* (periodique, French; from *period*.) 1. Circular; making a circuit; making a revolution (*Watts*). 2. Happening by revolution at some stated time (*Bentley*). 3. Regular; performing some action at stated times (*Addison*). 4. Relating to periods or revolutions (*Brown*).

PERIODICALLY. *ad.* (from *periodical*.) At stated periods (*Broome*).

PERIOECI, in geography, such inhabitants of the earth as have the same latitudes, but opposite longitudes; or live under the same parallel and the same meridian, but in different semicircles of that meridian, or in opposite points of the parallel. These have the same common seasons throughout the year, and the same phenomena of the heavenly bodies; but when it is noon-day with the one it is midnight with the other, there being twelve hours between them in an east or west direction. These are found on the globe, by the hour-index, or by turning the globe half round, that is 180 degrees either way.

PERIOSTEUM. (*περιοστεον*, from *περι*, about, and *οστειον*, a bone.) The membrane which invests the external surface of all the bones except the crowns of the teeth. It is of a fibrous texture, and well supplied with arteries, veins, nerves, and absorbents. It is called pericranium on the cranium; periorbita on the orbits; perichondrium when it covers cartilage; and peridesmium when it covers ligaments. Its use appears to be, to distribute the vessels on the external surfaces of bones.

PERIPATETICS, *Περικηταισται*, a sect of philosophers, the followers of Aristotle, or the maintainers of the Peripatetic philosophy: called also Aristotelians.

Cicero tells us, that Plato left two excellent disciples, Xenocrates and Aristotle, who founded two sects, which only differed in name; the former taking the appellation of Academics, who were those that continued to hold their conferences in the Academy, as Plato had done before: the others, who followed Aristotle, were called Peripatetics; from *περιπατεω*, I walk; because they disputed walking in the Lyceum.

Ammonius fetches the name Peripatetic from Plato himself, who only taught walking; and adds, that the disciples of Aristotle, and those of Xenocrates, were equally called Peripatetics; the one Peripatetics of the academy, the other peripatetics of the lyceum: but that, at length, the former quitted the title Peripatetic, for that of Academic, on occasion of the place where they assembled: and the latter retained simply that of Peripatetic.

The greatest and best part of Aristotle's philosophy, he borrowed from his master Plato: Serranus affirms confidently, and says he is able to demonstrate it, that there is nothing exquisite in any part of Aristotle's philosophy, dialectics, ethics, politics, physics, or metaphysics, but is found in Plato. And of this opinion are many of the ancient authors, Clemens Alexandrinus, &c.

PERIPATETICS.

Gale endeavours to shew, that Aristotle borrowed a good deal of his philosophy, both physical, about the first matter, and metaphysical, about the first being, his affections, truth, unity, goodness, &c. from the sacred books; and adds, from Clearchus, one of his (Aristotle's) scholars, that he made use of a certain Jew, who assisted him in his undertaking.

Aristotle's philosophy preserved itself in *puris naturalibus* for a long time: in the earlier ages of Christianity, the Platonic philosophy was more generally preferred; but this did not prevent the doctrine of Aristotle from forcing its way into the Christian church. Towards the close of the fifth century, it rose into considerable credit: the Platonists, interpreting, in their schools, some of the writings of Aristotle, particularly his dialectics, and recommending them to young persons. This seems to have been the first step to that universal dominion, which Aristotle afterwards obtained among the learned, which was at the same time much promoted by the controversies which Origen had occasioned. This father was zealously attached to the Platonic system; and therefore, after his condemnation, many, to avoid the imputation of his errors, and to prevent their being counted among the number of his followers, openly adopted the philosophy of Aristotle. Nor was any philosophy more proper for furnishing those weapons of subtle distinctions and captious sophisms, which were used in the Nestorian, Arian, and Eutychian controversies. About the end of the sixth century, the Aristotelian philosophy, as well as science in general, was almost universally decried; and it was chiefly owing to Boethius, who explained and recommended it, that it obtained a higher degree of credit among the Latins than it had hitherto enjoyed. Towards the end of the seventh century, the Greeks abandoned Plato to the monks, and gave themselves up entirely to the direction of Aristotle; and in the next century, the Peripatetic philosophy was taught every where in their public schools, and propagated in all places with considerable success. John Damascenus very much contributed to its credit and influence, by composing a concise, plain, and comprehensive view of the doctrines of the Stagyrte, for the instruction of the more ignorant, and in a manner adapted to common capacities. Under the patronage of Photius, and the protection of Bardas, the study of philosophy for some time declined, but was revived again about the end of the ninth century. About the middle of the 11th century, a revolution in philosophy commenced in France; when several famous logicians, who followed Aristotle as their guide, took nevertheless the liberty of illustrating and modelling anew his philosophy, and extending it far beyond its ancient limits. In the 12th century, three methods of teaching philosophy were in use by different doctors: the first was the ancient and plain method, which confined its researches to the philosophical notions of Porphyry, and the dialectic system, commonly attributed to St. Augustine, and in which was laid down this

general rule, that philosophical inquiries were to be limited to a small number of subjects, lest, by their becoming too extensive, religion might suffer by a profane mixture of human subtilty with its divine wisdom. The second method was called the Aristotelian, because it consisted in explications of the works of that philosopher, several of whose books, being translated into Latin, were almost every where in the hands of the learned. The third was termed the free method, employed by such as were bold enough to search after truth, in the manner the most adapted to render their inquiries successful, without rejecting the succours of Aristotle and Plato. A reformed system of the Peripatetic philosophy was first introduced into the schools in the university of Paris, from whence it soon spread throughout Europe, and has subsisted in some universities even to this day, under the name school philosophy. The foundation thereof is Aristotle's doctrine, often misunderstood, but oftener misapplied: whence the retainers thereto may be denominated reformed Peripatetics. Out of these have sprung, at various times, several branches: the chief are, the THOMISTS, SCOTISTS, and NOMINALISTS. See those articles.

On several of the topics treated by Aristotle, he was extremely vague and unsatisfactory, while on some few he was remarkably clear and luminous. Thus in his discussions on politics he states, in few words, the only legitimate purpose of political establishments. "Every political society (says he) forms, it is plain, a sort of community or partnership, instituted for the benefit of the partners. Utility is the end and aim of every such institution; and the greatest and most extensive utility is the aim of that great association comprehending all the rest, and known by the name of the commonwealth." Having stated and explained the grand purposes of society, he considers the best systems of means for attaining those purposes, and traces the distinction of ranks which arises from the inequalities of individual talents, virtue, and fortune. Political institutions are best fitted for promoting human happiness, when they are most suitable to the opinions and sentiments of the people, and the circumstances of the times and country. No one political system will equally suit all situations, and scarcely any two. Government being an arrangement, the best government must be the best arrangement, and the best arrangement is that in which the materials to be arranged are the best fitted both to receive and to preserve. The materials of the statesman or legislator are the number and character of his people, and the extent and quality of his country. The excellence of a commonwealth, however, is not to be estimated by its populousness or extent, but by its fitness for performing its proper functions; the same energies and habits constitute the happiness both of individuals and of nations. Men make governments, not governments them; nor by any system of political arrangements can a happy commonwealth be constituted from

fools or cowards, profligates or knaves. The bricks must be first prepared before the edifice can be reared. The human character is a compound of good and evil; the former arises from the balance of the affections, under the control and guidance of reason, the latter results from passion operating without restraint. That government is the best which most powerfully stimulates the energies of the people to beneficial purposes, and restrains them from hurtful pursuits. That must be a system of freedom, in the first place tempered by order, and moderation in the second. Mixed governments, wisely formed and balanced, best correspond to the state of mankind. Democracy, though apparently most agreeable to the rights of man, is not the best adapted to his wants; the general will, unrestrained, is apt to run into excess; to be precipitate in deliberation, and tardy in execution. While simple democracy is inexpedient for the people themselves, simple aristocracy and simple monarchy are equally inexpedient. The peripatetic system, after having prevailed with great and extensive dominion for many centuries, began rapidly to decline towards the close of the 17th, when the disciples of Ramus attacked it. It had also a succession of most formidable enemies in Galileo, Bacon, Descartes, Gassendi, Barrow, Newton, &c.

PERIPHERY. *s.* (περι and φερω.) Circumference (*Harvey*).

TO PERIPHRASE. *v. a.* (*periphraser*, Fr.) To express one word by many; to express by circumlocution.

PERIPHRAISIS. *s.* (περιφρασις; *periphrase*, Fr.) Circumlocution; use of many words to express the sense of one (*Watts*).

PERIPHRASTICAL. *a.* (from *periphrasis*.) Circumlocutory; expressing the sense of one word in many.

PERIPOCA. Virginian silk. In botany, a genus of the class pentandria, order digynia. Corol twisted; nectary surrounding the parts of fructification, putting forth five threads. Thirteen species, chiefly Asiatic plants; a few of the Cape. The following are cultivated.

1. *P. Græca*. Common Virginian silk. Stem shrubby, clasping any support, more than forty feet high, covered with a dark bark, and sending out slender branches which twine round each other; leaves ovate-lanceolate, near four inches long, two broad in the middle, pedicelled, lucid green above, pale below; flowers terminal, in bunches, of a purple colour. A native of Syria, flowering in July and August, but rarely ripening its seeds in this country.

2. *P. secamone*. Green peripoca.

3. *P. Indica*. Indian peripoca.

4. *P. Africana*. African peripoca.

The first sort often succeeds by cuttings, and is the only one that will bear the open air of this country. They may all be obtained by sowing their seeds procured from abroad, in pots of light earth plunged into a hot-bed. All of them require props, to prevent their trailing on the ground and fastening about other plants.

PERIPNEUMONIA. (*peripneumonia*, περιπνευμονία, from *πνευ*, and *πνευμων*, the lung.) Peripneumony, or inflammation of the lungs. See **PNEUMONIA**.

PERIPNEUMONIA NOTHA. Bastard or spurious peripneumony. Practitioners, it would appear, do not all affix this name to the same disease; some affirming it is a rheumatic affection of the respiratory muscles, while others consider it as a mild peripneumony. It is characterised by difficulty of breathing, great oppression at the chest, with obscure pains, cough, and occasionally an expectoration.

PERISCHII, in geography, the inhabitants of either frigid zone, between the polar circles and the poles, where the sun, when in the summer signs, moves only round about them, without setting; and consequently their shadows in the same day turn to all the points of the horizon.

TO PERISH. *v. n.* (*perir*, Fr. *perco*, Latin.)

1. To die; to be destroyed; to be lost; to come to nothing (*Locke*). 2. To be in a perpetual state of decay (*Locke*). 3. To be lost eternally (*Moreton*).

TO PE'RISH. *v. a.* To destroy; to decay: not in use (*Collier*).

PERISHABLE. *a.* (from *perish*.) Liable to perish; subject to decay; of short duration.

PERISHABLENESS. *s.* Liableness to be destroyed; liableness to decay (*Locke*).

PERISTALTIC MOTION. (*peristalticus*, περισταλτικός, from *πριστύνω*, to contract.) The vermicular motion of the intestines, by which they contract and propel their contents. A similar motion takes place in the Fallopian tubes, after conception, by means of which the ovum is translated from the ovarium into the uterus.

PERISTERIUM. (*peristerium*, περιστέριον, from *περιστέρον*, a pigeon, so called because pigeons cover it.) The herb vervain. See **VERBENA**.

PERISTYLE, in ancient architecture, a building encompassed with a row of columns on the inside.

PERISYSTOLE. (*perisystole*, περισυστολή, from *πριστύνω*, to compress.) The intermission or time between the contraction and dilatation of the heart.

PERITONÆUM. (*peritonæum*, περιτοναίον, from *περιτείνω*, to extend round.) A strong simple membrane, by which all the viscera of the abdomen are surrounded. It has an exceedingly smooth, exhaling, and moist internal surface. Outwardly, it is every where surrounded by cellular substance, which, towards the kidneys, is very loose and very fat; but is very short at the lower tendon of the transverse muscles. It begins from the diaphragm, which it completely lines; and, at the last fleshy fibres of the ribs, and the external lumbar fibres, it completes the septum, in conjunction with the pleura, with which it is continuous through the various intervals of the diaphragm. Posteriorly it descends before the kidneys; anteriorly, behind the abdominal muscles; it dips into the pelvis; from the bones of the

pubis, passes over the bladder, and descends behind; and being again carried backwards at the entrance of the ureters in two lunar folds, it rejoins upon the intestinum rectum, that part of itself which invests the loins, and in this situation lies before the rectum. The cellular texture, which covers the peritonæum on the outside, is continued into sheaths in very many places; of which one receives the testicles on each side, another the iliac vessels of the pelvis, viz. the obturatoria, those of the penis, bladder, and aorta, and, ascending to the breast, accompany the œsophagus and vertebræ; by means of which, there is a communication between the whole body and the peritonæum, well known in dropsical people. It has various prolongations, for covering the viscera. The shorter productions of this membrane are called ligaments; and are formed by a continuous reduplication of the peritonæum, receding from its inner surface, inclosing cellular substance, and extending to some viscus, where its plates separate, and, having diverged, embrace the viscus; but the intermediate cellular substance always accompanies this membranaceous coat, and joins it with the true substance of the viscus. Of this short kind of production, three belong to the liver, one or two to the spleen, and others to the kidneys, and to the sides of the uterus and vagina. By this means, the tender substance of the viscera is defended from injury by any motion or concussion, and their whole mass is prevented from being misplaced by their own weight, and from injuring themselves, being securely connected with the firm sides of the peritonæum.

PERITONITIS. (*peritonitis*, *περιτονίτις*, from *περιτοναϊον*, the peritonæum.) An inflammation of the peritonæum. A genus of disease in the class pyrexia and order phlegmasia of Cullen, known by the presence of pyrexia, with pain in the abdomen, that is increased when in an erect position. When the inflammation attacks the peritoneum of the viscera, it takes the name of the viscus: thus, peritonitis hepatis, peritonitis intestinalis, peritonitis omentalis, or epiploitis, or omentalis, peritonitis mesenterii.

PERITROCHIIUM, in mechanics, a wheel or circle, concentric with a cylinder, and moveable together with it about its axis. See **AXIS** and **AXLE**.

PERJURE. *s.* (*perjurus*, Latin.) A perjured or forsworn person: not in use (*Shakspeare*).

To **PERJURE.** *v. a.* (*perjuro*, Latin.) To forswear; to taint with perjury (*Shaks.*).

PERJURER. *s.* (from *perjure*.) One that swears falsely (*Spenser*).

PERJURY. *s.* (*perjuriū*, Latin.) False oath. See **OATH**.

PERIWIG. *s.* (*perruque*, French.) Adscitious hair; hair not natural, worn by way of ornament or concealment of baldness (*Swift*).

To **PERIWIG.** *v. a.* (from the noun.) To dress in false hair (*Swift*).

PERIWINKLE, in botany. See **VINCA**.

PERIWINKLE, in helminthology. See **TURBO**.

PERIZONIUS (James), a learned writer, who lived in the beginning of the last century. The name of his family, originally of Teutorp in Westphalia, was Voorbrock; but he changed it for the more classical one of Perizonius. He published, in 1669, the learned treatise *De Ratione studii Theologici*, after having been professor of divinity and the oriental languages both at Ham and Deventer. He died in 1717.

PERIZZITES, the ancient inhabitants of Palestine, mingled with the Canaanites. There is also a great probability that they themselves were Canaanites; but having no fixed habitations, sometimes dispersed in one country and sometimes in another, they were for that reason called Perizzites, which signifies scattered or dispersed. Pherazoth stands for hamlets or villages. The Perizzites did not inhabit any certain portion of the land of Canaan; there were some of them on both sides the river Jordan, in the mountains, and in the plains. In several places of scripture the Canaanites and Perizzites are mentioned as the two chief people of the country.

To **PERK.** *v. n.* (from *perch*, *Skinner*.) To hold up the head with an affected briskness.

To **PERK.** *v. a.* To dress; to prank (*Shakspeare*).

PERK. *a.* Pert; brisk; airy: obsolete (*Spenser*).

PERLOUS. *a.* (from *perilous*.) Dangerous; full of hazard (*Spenser*).

PERLEBERG, a town of Brandenburg, capital of the mark of Pregnitz. It has considerable cloth manufactures, and stands on the Stepenitz, 42 miles W.N.W. of Ruppín. Lon. 12. 3 E. Lat. 53. 8 N.

PERM, a government of Russia, formerly a province of Kasan. It is divided into two provinces, Perm, and Catharinenburg, the capitals of which are of the same name.

PERM, a town of Russia, capital of a government and province of the same name. It is seated on the Kama, at the influx of the Zegochekha, 620 miles E. by N. of Moscow, and 810 E. by S. of Petersburg. Lon. 55. 10 E. Lat. 57. 55 N.

PERMAGY. *s.* A little Turkish boot.

PERMANENCE. **PERMANENCY.** *s.* (from *permanent*.) 1. Duration; consistency; continuance in the same state; lastingness (*Hale*). 2. Continuance in rest (*Bentley*).

PERMANENT. *a.* (*permanens*, Latin.) 1. Durable; not decaying; unchanged (*Hooker*). 2. Of long continuance (*Kettlewell*).

PERMANENT, in botany, a term applied to leaves that remain on the plant till the fruit is ripe or after the summer is over.—To stipules continuing after the leaves drop off; as in the class diadelphia, and the order polygynia of class icosandria.—To calyxes, abiding after the corol is withered; as in the class didynamia.

PERMANENTLY. *ad.* (from *permanent*.) Durably; lastingly (*Boyle*).

PER

PERMANSION. *s.* (from *permaneo*, Lat.) Continuance (*Brown*).

PERMEABLE. *a.* (from *permeo*, Latin.) Such as may be passed through (*Boyle*).

PERMEANT. *a.* (*permeans*, Latin.) Passing through (*Brown*).

To **PERMEATE.** *v. a.* (*permeo*, Latin.) To pass through (*Woodward*).

PERMEATION. *s.* (from *permeate*.) The act of passing through.

PERMISCIBLE. *a.* (from *permisceo*, Lat.) Such as may be mingled.

PERMISSIBLE. *a.* (*permissus*, Latin.) What may be permitted.

PERMISSION. *s.* (*permission*, Fr. *permisus*, Latin.) Allowance; grant of liberty (*Milton*).

PERMISSIVE. *a.* (from *permitto*, Latin.) 1. Granting liberty, not favour; not hindering, though not approving (*Milton*). 2. Granted; suffered without hindrance; not authorized or favoured (*Milton*).

PERMISSIVELY. *ad.* By bare allowance; without hindrance (*Bacon*).

PERMISTION. *s.* (*permistus*, Latin.) The act of mixing.

To **PERMIT.** *v. a.* (*permitto*, Latin.) 1. To allow without command (*Hooker*). 2. To suffer without authorizing or approving. 3. To allow; to suffer (*Locke*). 4. To give up; to resign (*Dryden*).

PERMIT. *s.* A written permission from an officer for transporting goods from place to place, shewing the duty on them to have been paid.

PERMITTANCE. *s.* (from *permit*.) Allowance; permission. A bad word (*Derham*).

PERMIXTION. *s.* (from *permistus*, Lat.) The act of mingling; the state of being mingled (*Brerewood*).

PERMUTATION. *s.* (*permutation*, Fr. *permutatio*, Latin.) Exchange of one for another (*Ray*).

PERMUTATION, in arithmetic. See **ALTERNATION**.

To **PERMUTE.** *v. a.* (*permuto*, Latin; *permuter*, Fr.) To exchange.

PERMUTER. *s.* (*permutant*, French.) An exchanger; he who permutes.

PERNAU, a fortified town of Russia, in Livonia, with a castle; seated near the mouth of a river of the same name, 95 miles N. of Riga. Lon. 24. 30 E. Lat. 58. 30 N.

PERNICIOUS. *a.* (*perniciosus*, Latin.) 1. Mischievous in the highest degree; destructive (*Shakspeare*). 2. (*pernix*, Latin.) Quick; not used (*Milton*).

PERNICIOUSLY. *ad.* Destructively; mischievously; ruinously (*Shakspeare*).

PERNICIOUSNESS. *s.* (from *pernicious*.) The quality of being pernicious.

PERNICITY. *s.* (from *pernix*.) Swift-ness; celerity (*Ray*).

PERNIO. (*pernio*.) A chilblain. A species of erythema of Cullen.

PEROLA, in botany. See **MOMORDICA**.

PER

PERONEUS ANTICUS, in anatomy. See **PERONEUS BREVIS**.

PERONEUS BREVIS. (*peroneus musculus*, *περοναιος*, from *perone*, the fibula.) This muscle, which is in a great measure covered by the last described muscle, is the *peroneus secundus* seu *anticus* of Douglas, and the *peroneus medius* seu *anticus* of Winslow. It arises by an acute, thin, and fleshy origin from the anterior and outer part of the fibula, its fibres continuing to adhere to the lower half of that bone. Its round tendon passes through the groove in the malleolus externus, along with that of the *peroneus longus*, after which it runs in a separate groove to be inserted into the upper and posterior part of the tubercle at the basis of the metatarsal bone, that supports the little toe. Its use is to assist the *peroneus longus*.

PERONEUS LONGUS. This muscle, which is the *peroneus primus* seu *posticus* of Douglas, and the *peroneus maximus* seu *posterior* of Winslow, is situated somewhat anteriorly along the outer side of the leg. It arises tendinous and fleshy from the external lateral part of the head of the tibia, and likewise from the upper anterior surface and outer side of the perone or fibula, its fibres continuing to adhere to the outer surface of the latter to within three or four inches of the malleolus externus. It terminates in a long round tendon, which runs obliquely behind the malleolus internus, where it passes through a cartilaginous groove in common with the *peroneus brevis*, being bound down by an annular ligament. When it has reached the os calcis, it quits the tendon of the *peroneus brevis*, and runs obliquely inwards along a groove in the os cuboides, under the muscles on the sole of the foot, to be inserted into the outside of the posterior extremity of the metatarsal bone that supports the great toe. Near the insertion of this muscle we find a small bursa mucosa. This muscle draws the foot outwards, and likewise assists in extending it.

PERONEUS MAXIMUS. See **PERONEUS LONGUS**.

PERONEUS MEDIUS. See **PERONEUS BREVIS**.

PERONEUS POSTICUS. See **PERONEUS LONGUS**.

PERONEUS PRIMUS. See **PERONEUS LONGUS**.

PERONEUS TERTIUS. This is the name given by Albinus to a muscle which, by some writers, is called *nonus Vesalii*, or *Vesalius's* ninth muscle of the foot; but by most considered in the present day as a portion of the *extensor longus digitorum pedis*. It is situated at the anterior, inferior, and outer part of the leg, along the outer edge of the last described muscle, to which it is intimately united. It arises fleshy from the anterior surface of the lower half of the fibula, and from the adjacent part of the interosseous ligament. Its fibres run obliquely downwards, towards a tendon which passes under the annular ligament, and then running obliquely outwards, is insert-

ed into the root of the metatarsal bone that supports the little toe.

This muscle assists in bending the foot.

PERONEUS SECUNDUS. See PERONEUS BREVIS.

PERONES, in antiquity, a kind of high-shoes worn by men of ordinary rank in Rome.

PERONNE, a strong town of France, in the department of Somme. It is called Pucelle, because it has never been taken, though often besieged. The castle was the imprisonment of Charles the simple, who here miserably died; and in this castle the duke of Burgundy detained Lewis XI. three days, till he consented to sign a disadvantageous treaty. It is seated on the Somme, 27 miles S.W. of Cambray, and 80 E. by N. of Paris. Lon. 3. 2 E. Lat. 49. 55 N.

PERORATION, *peroratio*, in rhetoric, the epilogue, or last part, of an oration; wherein whilst the orator had insisted on through his whole discourse is urged afresh, with greater vehemence and passion.

The peroration consists of two parts: 1. Recapitulation, wherein the substance of what was diffused throughout the whole speech is collected briefly and cursorily, and summed up with new force and weight.

2. The moving the passions; which is so peculiar to the peroration, that the masters of the art call this part *sedes affectuum*.

PEROTIS, in botany, a genus of the class triandria, order digynia. Calyxless; corol two-valved, the valves equal, awned, invested on the outside with very long wool. Three species, Indian grasses with flowers in thin spikes; florets pedicelled and purplish.

PEROUSE (John Francis Galoup de la), the celebrated, though unfortunate, French navigator, was born at Albi in 1741. Of the rank or condition of his father, M. Milet-Mureau has given us no information in that meagre eulogy of Perouse which he has inserted in the introduction to his last voyage. It appears, however, that he intended to make his son a seaman, and sent him, at a very early period of life, to the marine school, where the young man became enthusiastically fond of his profession, and laudably ambitious to emulate the fame of the most celebrated navigators.

Being appointed a midshipman on the 19th of November 1756, he behaved, we are told, with great bravery in that station, and was severely wounded in the engagement between the admirals Hawke and Conflans, on the 20th of November 1759. The Formidable, in which he served, was taken, after a vigorous resistance; and it is probable that Perouse reaped some advantage from his acquaintance with British officers.

On the 1st of October 1764 he was promoted to the rank of lieutenant; and despising a life of ease and idleness, he contrived to be employed in six different ships of war during the peace that subsisted between Great Britain and France. In 1767 he was promoted to the rank of what, in our navy, is called master and commander. In 1779 he commanded the

Amazone, belonging to the squadron of vice-admiral count d'Estaing; and when that officer engaged admiral Byron, the post of La Perouse was to carry his admiral's orders to the whole of the line. He afterwards took the sloop Ariel, and contributed to the capture of the Experiment—exploits which his eulogist seems to consider as instances of very uncommon heroism; but he soon after performed a greater.

Being, on the 4th of April, 1780, appointed captain of the frigate Astrea, and being on a cruise with the Hermione, these two frigates attacked six English vessels of war, of from 28 to 14 guns each, and took two of them. The French certainly reaped more laurels about that period than they have been accustomed to do in naval wars with Great Britain; but as we have completely forgotten the particulars of this fight, we suspect that it was not altogether so very brilliant a business as M. Milet-Mureau is pleased to represent it.

In the year 1782, La Perouse was dispatched with the Sceptre of 74 guns, and two frigates of 36 guns each, having some troops and field pieces on board, to destroy the English settlements in Hudson's Bay. This task was easily accomplished; for when he had surmounted the difficulties of navigation in a frozen sea, he found nothing on shore to oppose the smallest force. Having destroyed the settlements, he learned that some of the English had fled at his approach into the woods; and his eulogist considers it (such are the dispositions of French republicans) as a most wonderful instance of humanity, that he left to these unfortunate men provisions to preserve them from perishing by hunger, and arms to protect them from the fury of the savages! Perouse, we dare answer for him, was conscious of nothing heroic or extraordinary in this act of beneficence, which he certainly could not have omitted, without incurring both infamy and guilt.

In the year 1785, he was appointed to the command of a voyage round the world; which was unfortunately destined to be his last. Of this voyage, as far as it was accomplished, there is a full account in the hands of every French and English reader; and from that account it appears, that Perouse was admirably qualified to discharge such a trust. He seems to have been an experienced and skilful seaman; a man of considerable mathematical and physical science, uncorrupted by that philosophy which disgraced many of his attendants; and capable of the utmost perseverance in every laudable pursuit. To these qualities he united a proper combination of caution and courage, with a disposition truly benevolent to the various tribes of savages whom he visited. The disasters which occurred on the voyage were all, except the last, of which nothing is known, occasioned by the disobedience of his officers, or their neglecting to follow his advice.

The last dispatches of this great and good man were dated from Botany Bay, February the 7th, 1788; and since that period, no account of him has been received which is inti-

pled to the smallest confidence. Of course the place and time of his death are unknown.

To **PERPEND.** *v. a.* (*perpendo*, Lat.) To weigh in the mind; to consider attentively (*Shakspeare*).

PERPENDER. *s.* (*perpigne*, Fr.) A coping stone.

PERPENDICLE. *s.* (*perpendicular*, Fr. *perpendicularum*, Lat.) Any thing hanging down by a straight line.

PERPENDICULAR. *a.* (*perpendiculaire*, Fr. *perpendicularis*, Latin.) 1. Crossing any other line at right angles (*Newton*). 2. Cutting the horizon at right angles (*Brown*).

PERPENDICULAR, in geometry, a line standing upon another line, so as to make equal angles on each side, or a right angle on either side.

PERPENDICULAR OF A CONIC SECTION OR CURVE. See **CURVE** and **NORMAL**.

PERPENDICULAR, in gunnery, is a small instrument, used for finding the centre line of a piece in the operation of pointing it to a given object.

PERPENDICULARLY. *ad.* 1. In such a manner as to cut another line at right angles. 2. In the direction of a straight line up and down (*More*).

PERPENDICULARITY. *s.* (from *perpendicular*.) The state of being perpendicular (*Watts*).

PERPENSION. *s.* (from *perpend*.) Consideration: not in use (*Brown*).

To **PERPETRATE.** *v. a.* (*perpetro*, Lat.) To commit; to act. Always in an ill sense.

PERPETRATION. *s.* (from *perpetrate*.) 1. The act of committing a crime (*Wolton*). 2. A bad action (*King Charles*).

PERPETUAL. *a.* (*perpetuel*, Fr. *perpetuus*, Latin.) 1. Never ceasing; eternal with respect to futurity (*Dryden*). 2. Continual; uninterrupted; perennial (*Arbuthnot*). 3. Perpetual screw. A screw which acts against the teeth of a wheel, and continues its action without end (*Wilkins*).

PERPETUALLY. *ad.* (from *perpetual*.) Constantly; continually; incessantly (*Newton*).

To **PERPETUATE.** *v. a.* (*perpetuo*, Lat.) 1. To make perpetual; to preserve from extinction; to eternize (*Addison*). 2. To continue without cessation or intermission (*Hammond*).

PERPETUATION. *s.* (from *perpetuate*.) The act of making perpetual; incessant continuance (*Brown*).

PERPETUITY. *s.* (*perpetuitas*, Latin.) 1. Duration to all futurity (*Hooker*). 2. Exemption from intermission or cessation (*Holder*). 3. Something of which there is no end (*Pope*).

PERPETUITY, in the doctrine of annuities, is the number of years in which the simple interest of any principal sum will amount to the same as the principal itself; or it is the number of years' purchase to be given for an annuity which is to continue for ever; and it is found by dividing 100l. by the rate of interest agreed upon; thus allowing 5 per cent, the

perpetuity is $L. \frac{100}{5} = 20$; and at the rates usually adopted, the perpetuity is as follows:

$$\text{At 3 per cent. } \frac{100}{3} = 33.333, \&c.$$

$$3\frac{1}{2} \dots \dots \frac{100}{3.5} = 28.57, \&c.$$

$$4 \dots \dots \frac{100}{4} = 25.$$

$$4\frac{1}{2} \dots \dots \frac{100}{4.5} = 22.22, \&c.$$

$$5 \dots \dots \frac{100}{5} = 20.$$

$$6 \dots \dots \frac{100}{6} = 16.66, \&c.$$

$$7 \dots \dots \frac{100}{7} = 14.28, \&c.$$

$$8 \dots \dots \frac{100}{8} = 12.5.$$

These are the number of years purchase to be given for a perpetual annuity, on the supposition that it is receivable yearly.

PERPETUITY, in law, is where, if all that have interest join in the conveyance, yet they cannot bar or pass the estate; for, if by concurrence of all having interest, the estate may be barred, it is no perpetuity.

PERPIGNAN, a fortified town of France, capital of the department of Eastern Pyrenees, with a good citadel and a university. It was lately a bishop's see, and is seated on the Tet, near the Mediterranean, 95 miles S.E. of Toulouse. Lon. 2. 54 E. Lat. 42. 42 N.

To **PERPLE'X.** *v. a.* (*perplexus*, Latin.) 1. To disturb with doubtful notions; to entangle; to make anxious; to tease with suspense or ambiguity; to distract (*Dryden*). 2. To make intricate; to involve; to complicate (*Addison*). 3. To plague; to vex: not used (*Granville*).

PERPLE'X. *a.* (*perplex*, Fr. *perplexus*, Lat.) Intricate; difficult. *Perplexed* is the word in use (*Granville*).

PERPLE'XEDLY. *ad.* (from *perplexed*.) Intricately; with involution.

PERPLE'XEDNESS. *s.* (from *perplexed*.) 1. Embarrassment; anxiety. 2. Intricacy; involution; difficulty (*Locke*).

PERPLE'XITY. *s.* (*perplexité*, Fr.) 1. Anxiety; distraction of mind (*Spenser*). 2. Entanglement; intricacy (*Shillingfleet*).

PERPOTATION. *s.* (*per* and *poto*, Lat.) The act of drinking largely.

PERQUISITE. *s.* (*perquisitus*, Lat.) Something gained by a place or office over and above the settled wages (*Addison*).

PERQUISITED. *a.* (from *perquisite*.) Supplied with perquisites (*Savage*).

PERQUISITION. *s.* (*perquisitus*, Latin.) An accurate inquiry; a thorough search (*Ainsworth*).

PERRON (James Davy Du), a cardinal distinguished by his abilities and learning, was born in the canton of Bern in 1556. He was

educated by Julian Davy, his father, a very learned Calvinist, who taught him Latin and the mathematics; after which, he by himself became acquainted with the Greek and Hebrew, philosophy and the poets. Philip Desportes, abbot of Tyron, made him known to Henry III. king of France, who conceived a great esteem for him. Some time after, Du Perron abjured Calvinism, and afterwards embraced the ecclesiastical function; and having given great proofs of his wit and learning, he was chosen to pronounce the funeral oration of Mary queen of Scots. After the murder of Henry III. he retired to the house of cardinal de Bourbon, and took great pains in bringing back the protestants to the church of Rome. Among others, he gained over Henry Spondanus, afterwards bishop of Pamiers. He also chiefly contributed to engage Henry IV. to change his religion; and that prince sent him to negotiate his reconciliation to the holy see, in which he succeeded. Du Perron was consecrated bishop of Evreux while he resided at Rome. On his return to France, he wrote, preached, and disputed against the reformed; particularly against Du Plessis Mornay, with whom he had a public conference in the presence of the king at Fontainebleau. He was made cardinal in 1604 by pope Clement VIII. at the solicitation of Henry IV. who afterwards nominated him to the archbishopric of Sens. The king at length sent him to Rome with cardinal Joyeuse, in order to terminate the disputes which had arisen between Paul V. and the Venetians. It is said that this pope had such an high opinion of the address of the cardinal Du Perron, that he used to say, "Let us pray to God to inspire the cardinal Du Perron, for he will persuade us to do whatever he pleases." After the death of Henry IV. he retired into the country, where he put the last hand to his works; and, setting up a printing-house, corrected every sheet himself. He died at Paris in 1618. His works were collected after his death, and published at Paris in 3 vols. folio.

PERRONET (John Rodolphus), rose by his merit to the office of director general of bridges and roads in France. He was for his services rewarded with the order of St. Michael, and became inspector, and afterwards director of the school of engineers at Paris. The bridges of Neuilly, Nantes, Orleans, &c. were constructed under his direction, and the public roads of the kingdom were improved by his plans. He died 1794, aged 86. He published a very curious and valuable description of the bridges which he had erected, 2 vols. folio—memoirs on the method of constructing grand arches of stone from 200 to 500 feet, over vallies, 4to. &c.

PERROT (Nicholas), Sieur d'Abancourt, one of the first geniuses of his age, was born at Chalons in 1606. After studying philosophy about three years, he was sent to Paris to follow the law. At eighteen years of age he was admitted advocate of parliament, and frequent-

ed the bar; but he soon conceived a distaste for it, and therefore discontinued his practice. This displeased an uncle, but whose favour he recovered by quitting the protestant religion. He could not, however, be prevailed upon to take orders in the Romish church; and some years after, he had a desire to return to the religion he had abjured. But, that he might not do any thing rashly, he resolved to study philosophy and divinity. For that purpose he chose for his master Mr. Stuart, a Scotsman and Lutheran, a man of great learning. Almost three years he spent in the most assiduous study; and then set out from Paris to Champagne, where he abjured the Roman catholic, and once more embraced the protestant religion. In 1637 he was admitted a member of the French academy; a little after which, he undertook a translation of Tacitus. Whilst he was engaged in that laborious task, he retired to his small estate of Ablancourt, and lived there till his death in 1664. He was a man of fine understanding, of great piety and integrity, and of universal learning. Moreri has given a catalogue of his works, the greatest part of which consist of translations, which seemed rather originals.

PERRUKE, PERUKE, or PERTWIG, was anciently a name for a long head of natural hair; such, particularly, as there was care taken in the adjusting and trimming of. Menage derives the word very fancifully from the Latin *pilus*, hair. It is derived, according to this critic, thus: *pilus*, *pelus*, *pelutus*, *peluticus*, *pelutica*, *perutica*, *peruca*, *perruque*.

PERRY, a drink made from pears in the same manner that cyder is from apples. See CYDER.

PER SE, in the schools, is sometimes opposed to *per accidens*. In which sense, a thing is said to agree with another *per se*, when the agreement is not owing to any accidental event, but is found in the intrinsic principles of things themselves.

PER SE is sometimes also opposed to *per aliud*. In which sense, God alone is said to have a being *per se*, as not deriving it from any other, but having it necessarily, and of himself.

PER SE, again, sometimes signifies as much as, of its own nature, or in virtue of its own entity. Thus the sun is said to give light *per se*; and thus quantity is extended *per se*.

PER SE, among logicians. A thing is said to be known *per se*, *per se notum*, when we immediately perceive it upon the first proposing of the terms. As, that the whole is greater than its parts.

PERSEA, in botany. See LAURUS.

TO PERSECUTE. *v. a.* (*persecuter*, Fr. *persecutus*, Latin.) 1. To harass with penalties; to pursue with malignity (*Acts*). 2. To pursue with repeated acts of vengeance or enmity (*Dryden*). 3. To importune much.

PERSECUTION. *s.* (*persecution*, Fr. *persecutio*, Latin.) 1. The act or practice of persecuting (*Addison*). 2. The state of being persecuted (*Sprat*).

PERSECUTION, is any pain or affliction which a person designedly inflicts upon another; and in a more restrained sense the sufferings of Christians on account of their religion. Historians usually reckon ten general persecutions, the first of which was under the emperor Nero, 31 years after our Lord's ascension; when that emperor, having set fire to the city of Rome, threw the odium of that execrable action on the Christians, who under that pretence were wrapped up in the skins of wild beasts, and worried and devoured by dogs; others were crucified, and others burnt alive. The second was under Domitian, in the year 95. In this persecution St. John the apostle was sent to the isle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for several years. The fourth was under Antoninus the philosopher, when the Christians were banished from their houses, forbidden to show their heads, reproached, beaten, hurried from place to place, plundered, imprisoned, and stoned. The fifth began in the year 197, under the emperor Severus. The sixth began with the reign of the emperor Maximinus in 235. The seventh, which was the most dreadful persecution that had ever been known in the church, began in the year 250, in the reign of the emperor Decius, when the Christians were in all places driven from their habitations, stripped of their estates, tormented with racks, &c. The eighth began in the year 257, in the fourth year of the reign of the emperor Valerian. The ninth was under the emperor Aurelian, A.D. 274; but this was very inconsiderable; and the tenth began in the 19th year of Dioclesian, A. D. 303. In this dreadful persecution, which lasted ten years, houses filled with Christians were set on fire, and whole droves were tied together with ropes and thrown into the sea. Hence, pillars were erected in Spain in honour of Dioclesian, for having "every where abolished the superstition of Christ;" and a medal of this emperor, still extant, was struck with the inscription, "*Nomine Christianorum deleto.*" See Milner's Church History, vol. ii. p. 6, 7; and Gregory's Letters on the Evidences, Doctrines, and Duties of the Christian Religion, vol. i. p. 245.

PERSECUTOR. *s.* (*persecuteur*, Fr. from *persecute*.) One who harasses others with continued malignity (*Milton*).

PERSEES, the descendants of a colony of ancient Persians, who took refuge at Bombay, Surat, and in the vicinity of those cities, when their own country was conquered 1100 years ago by the Mahometan Arabs. They are a gentle, quiet, and industrious people, loved by the Hindus, and living in great harmony among themselves. The consequence is, that they multiply exceedingly, whilst their countrymen in the province of Keman are visibly diminishing under the yoke of the Mahometan Persians. Of the manners and customs of this amiable race an interesting account is given in Niebuhr's Travels.

PERSEPHONE, a daughter of Jupiter and Ceres, called also Proserpine. (Vid. *PROSERPINA*.)—2. The mother of Amphion by Jasus.

PERSEPOLIS, a celebrated city, the capital of the Persian empire. It was laid in ruins by Alexander after the conquest of Darius. The reason of this is unknown. Some suppose that Alexander set it on fire at the instigation of Thais, one of his courtizans, when he had passed the day in riot and debauchery. The ruins of Persepolis still astonish the modern traveller by their grandeur and magnificence.

PERSEVERANCE. *s.* (*persevéance*, Fr. *perseverantia*, Lat.) 1. Persistence in any design or attempt; steadiness in pursuits; constancy in progress (*King Charles*). 2. Continuance in a state of grace (*Hammond*).

PERSEVERANT. *a.* (*perseverant*, Fr. *perseverans*, Lat.) Persisting; constant.

To PERSEVERE. *v. n.* (*persevero*, Lat. *perseverer*, French.) To persist in an attempt; not to give over; not to quit the design (*Wake*).

PERSEVERINGLY. *ad.* (from *persevere*.) With perseverance.

PERSEUS, in fabulous history, a son of Jupiter and Danae, the daughter of Acrisius. As Acrisius had confined his daughter in a brazen tower, to prevent her becoming a mother, because he was to perish, according to the words of an oracle, by the hands of his daughter's son; Perseus was no sooner born (vid. *DANAË*), than he was thrown into the sea with his mother Danae. The hopes of Acrisius were frustrated; the boat which carried Danae and her son was driven upon the island of Seriphos, one of the Cyclades, where they were found by a fisherman, and carried to Polydectes, the king of the place. They were treated with great humanity, and Perseus was entrusted to the care of the priests of Minerva's temple. His rising genius soon displeased Polydectes, who wished to offer violence to Danae, yet feared the resentment of her son. Polydectes, however, resolved to remove every obstacle. He invited his friends to an entertainment, who were to present the monarch with a beautiful horse. Perseus was also invited, as Polydectes knew that he could not receive from him the expected present. Perseus told the king, that as he could not give him a horse, he would bring him the head of the mortal gorgon Medusa. The offer was doubly agreeable to Polydectes, as the attempt might end in the ruin of Perseus. But the innocence of Perseus was patronized by the gods. Pluto lent him his helmet, Minerva her buckler, and Mercury his wings and talaria, with a short dagger called *herpe*. With these arms Perseus traversed the air, conducted by Minerva, and having discovered from the Graiæ, the sisters of the Gorgons, the place of their residence, he instantly flew to it. According to Hesiod and Apollodorus, it was beyond the western ocean. Having found them asleep, he approached them, and cut off Medusa's

head with one blow. The noise awoke the two sisters, but Pluto's helmet rendered Perseus invisible. The conqueror made his way through the air, and from the blood of Medusa's head sprang those innumerable serpents in the deserts of Libya. Chrysaor also, with his golden sword, sprang from the drops of blood, as well as the horse Pegasus. Mean time Perseus had crossed the deserts of Libya, but the approach of night obliged him to alight in the territories of Atlas, king of Mauritania, where the monarch not only refused Perseus the hospitality he demanded, but he even offered violence to his person. Perseus finding himself inferior to Atlas, showed him Medusa's head, and instantly he was changed into a large mountain which bore the same name, in Africa. Perseus continued his flight, and as he passed over Libya, he discovered on the coasts of Æthiopia the naked Andromeda, exposed to a sea monster. He was struck at the sight, and offered her father Cepheus to deliver her if he obtained her in marriage. Cepheus consented, and immediately Perseus flew towards the monster, then advancing to devour Andromeda, and he plunged his dagger in his right shoulder, and destroyed it. This happy event was attended with the greatest rejoicings, and the nuptials were celebrated with the greatest festivity. The universal joy, however, was soon disturbed. Phineus, Andromeda's uncle, attempted to carry away the bride; a bloody battle ensued, and Perseus again shewed the Gorgon's head to his adversaries, and they were instantly turned to stone, each in the posture and attitude in which he then stood. Perseus, after this adventure, retired to Seriphos, at the moment that his mother Danae fled to the altar of Minerva to avoid Polydectes, who attempted to offer her violence. Polydectes met the same fate as Atlas and Phineus, he was also turned into a stone by the power of Medusa's head. And Dictys, who had formerly saved the life of Perseus and Danae, was placed by Perseus on the throne of Seriphos. He then restored the armour he had received from the gods, having placed the Gorgon's head on the Ægis of Minerva. After these exploits, Perseus embarked for the Peloponnesus with his mother and Andromeda. When he reached the coast he was informed that Teutamias, king of Larissa, was then celebrating funeral games in honour of his father. This intelligence drew him to Larissa, to signalize himself in throwing the quoit, of which, according to some, he was the inventor. But here he was attended by an evil fate, and had the misfortune to kill a man with a quoit which he had thrown in the air. This was his grandfather Acrisius, and the oracle was fulfilled. This unfortunate murder greatly depressed the spirits of Perseus: by the death of Acrisius he was entitled to the throne of Argos, but he refused to reign there, and exchanged his kingdom for that of Tirynthus, and the maritime coast of Argolis, where Megapenthes the son of Proetus then reigned. Being settled in this part of the Peloponnesus,

he determined to found a new city, which he made the capital of his dominions, and which he called Mycenæ, because the pommel of his sword, called by the Greeks myces, had fallen there. The time of his death is unknown, yet it is universally agreed that he received divine honours like the rest of the ancient heroes. Perseus had by Andromeda, Alceus, Sthenelus, Nestor, Electryon, and Gorgophone, and after death, according to some mythologists, he became a constellation in the heavens.

PERSEUS, in astronomy, a constellation of the northern hemisphere, which, according to the catalogues of Ptolemy and Tycho, contains twenty-nine stars; but in the Britannic catalogue, sixty-seven.

PERSEUS, or PERSES, a son of Philip king of Macedonia, who distinguished himself, like his father, by his enmity to the Romans, and declared war against them. He wanted courage and resolution, and his avarice and his timidity proved destructive to his cause. When Paulus Æmilius was appointed to the command of the Roman armies in Macedonia, Perseus shewed his inferiority by his imprudent incampments, and at the famous battle at Pydna, B. C. 168, he was the first who fled as soon as the battle was begun, leaving the enemy masters of the field. From Pydna, Perseus fled to Samothrace; but he was soon discovered and brought to the Roman conqueror, where the meanness of his behaviour exposed him to ridicule. He was carried to Rome, and dragged along the streets of the city to adorn the triumph of the conqueror. His family were also exposed to the sight of the Roman populace, who shed tears on viewing, dragged like a slave, a monarch who had once spread alarm all over Italy, by the greatness of his military preparations. Perseus died in prison, or according to some he was put to a shameful death the first year of his captivity.

PERSHORE, a town in Worcestershire, with a market on Tuesday, and a manufacture of stockings. Here are two churches, and that of Holy Cross contains several ancient monuments. It is seated on the Avon, nine miles E.S.E. of Worcester, and 106 W.N.W. of London.

PERSIA, a celebrated kingdom of Asia, which in its ancient state extended from the Hellespont to the Indus, above 2800 miles, and from Pontus to the shores of Arabia above 2000 miles. As a province, according to Ptolemy, it was bounded on the north by Media, west by Susiana, south by the Persian gulf, and east by Carmania. The empire of Persia was first founded by Cyrus the Great, about 559 years before the Christian era, and under the succeeding monarchs it became one of the most powerful kingdoms of the earth. The destruction of the Persian monarchy by the Macedonians was easily effected, and from that time Persia became tributary to the Greeks. After the death of Alexander, Seleucus Nicanor made himself master of the Persian provinces, till the revolt of the Parthians introduced new

revolutions. Persia was partly reconquered from the Greeks, and remained tributary to the Parthians for near 500 years. Artaxerxes, a common soldier, A. D. 220, became the founder of the second Persian monarchy, which proved so inimical to the Roman emperors. In their national character, the Persians were warlike; they were early taught to ride, and to handle the bow, and by the manly exercises of hunting, they were inured to bear the toils and fatigues of a military life. Their national valour, however, soon degenerated, and their want of employment at home soon rendered them unfit for war. The celebrated action at Thermopylæ, and Marathon, and the succeeding actions at Salamis, Plataea and Mysale, shew in a strong light the superiority of the Grecian soldiers over the Persians. The Persians were anciently called Cephenees, Achæmenians, and Artæi. They received the name of Persians from Perses the son of Perseus and Andromeda, who is supposed to have settled among them. Persepolis was the capital of the country.

PERSIA (Modern), is bounded on the N. by Georgia, the Caspian sea, and Usbec Tartary, W. by Turkey and Arabia, S. by the gulfs of Persia and Ormus and the Arabian sea, and E. by Hindustan. It is 1220 miles from E. to W. and 900 from N. to S. In the N. and E. parts it is mountainous and cold; in the middle and S.E. parts, sandy and desert; in the S. and W. level and extremely fertile, though for several months very hot. The chief rivers are the Tigris and Kur; but there are many others, and several in the interior which are lost in sandy deserts. The soil produces all sorts of pulse and corn, except oats and rye. In several places, naphtha, a sort of bitumen, rises out of the ground; and there are mines of gold, silver, iron, turcois stones, and salt; but the first two of these are not worked, on account of the scarcity of wood. Among the products of Persia that are peculiarly excellent, are dates, pistachio-nuts, and poppies, that produce the finest opium. There are extensive plantations of mulberry-trees for silkworms; and large flocks of sheep and goats. The camels, horses, mules, asses, oxen, and buffaloes, are the best of their kind, and are indifferently used for carrying passengers or burdens, the horses excepted, which are only used for the saddle. The principal manufactures are silks, as satins, tabbies, taffetas, and silk mixed with cotton, or with camels or goats hair; brocades, gold tissues, and gold velvet, carpets, calicoes, camlets, &c. During almost the whole of this century, Persia has been desolated by competitors for the sovereignty. On the assassination of the usurper, Nadir Shah, in 1747, Ahmed Abdalla, one of his generals, founded the kingdom of Candahar, to which he annexed the provinces of Korasan and Segestan, in the E. part of Persia, and those provinces of Hindustan Proper, W. of the Indus, that had been ceded by the great mogul, in 1737, to Nadir Shah. Kerim Khan, another of Nadir's officers, obtained the sovereignty of all the southern provinces. He transferred the seat of

government from Ispahan to Schiras. He refused the title of Shah, or king, being satisfied with that of Protector of Persia. He was beloved by his subjects, and revered by foreign powers. On his death, in 1779, new competitors for the throne sprung up, and have almost ever since continued to spread slaughter and desolation over this unhappy country. The Persians are generally Mahometans, of the sect of Ali. Schiras is the capital.

PERSIA (Gulf of), a gulf between Persia and Arabia Felix. The entrance near Ormus is not above 30 miles over; but within it is 180 in breadth, and the length from Ormus to the mouth of the Euphrates is 420 miles.

PERSIAN LILY. See FRITILLARIA.

PERSIAN WHEEL, an engine, or wheel, turned by a rivulet, or other stream of water, and fitted with open boxes at its cogs, to raise water for the overflowing of lands, or other purposes. It may be made of any size, according to the height the water is to be raised to, and the strength of the stream by which it is turned. This wheel is placed so, that its bottom only is immersed in the stream, wherein the open boxes at its cogs are all filled one after another with water, which is raised with them to the upper part of the wheel's circuit, and then naturally empties itself into a trough which carries it to the land.

PERSIAN or PERSIC, in architecture, a name common to all statues of men, serving instead of columns to support entablatures.

PERSICA. (*персика*, from Persia, its native soil). The peach. The fruit of the amygdalus persica of Linnæus. It is known to be grateful and wholesome, seldom disagreeing with the stomach, unless this organ is not in a healthy state, or the fruit has been eaten to excess, when effects similar to those of the other dulco-acid summer fruits may be produced. The flowers, including the calyx, as well as the corol, are the parts of the persica used for medicinal purposes. These have an agreeable but weak smell, and a bitterish taste. Boulduc observes "that when distilled, without addition, by the heat of a water bath, they yield one-sixth their weight, or more, of a whitish liquid, which communicates to a considerable quantity of other liquids a flavour like that of the kernels of fruits." These flowers have a cathartic effect, and, especially to children, have been successfully given, in the character of a vermifuge; for this purpose, an infusion of a dram of the flowers dried, or half an ounce in their recent state, is the requisite dose. The leaves of the persica are also found to possess an anthelmintic power, and from a great number of experiments appear to have been given with invariable success both to children and adults. However, as the leaves and flowers of the persica manifest in some degree the quality of those of the laurocerasus, they ought to be used with caution. See AMYGDALUS.

PERSICARIA, in botany. See POLYGNUM.

PERSIMON PLUM. See DIOSPYROS.

To PERSIST. *v. n.* (*persisto*, Lat. *persister*, Fr.) To persevere; to continue firm; not to give over (*South*).

PERSISTENCE. PERSISTENCY. *s.* (from *persist*. Persistence seems more proper.) 1. The state of persisting; steadiness; constancy; perseverance in good or bad (*Government of the Tongue*). 2. Obstinacy; obduracy; contumacy (*Shakspeare*).

PERSISTIVE. *a.* (from *persist*.) Steady; not receding from a purpose; persevering (*Shakspeare*).

PERSIUS FLACCUS (Aulus), a Latin poet of Volaterræ. The early part of his life was spent in his native town, and at the age of sixteen he was removed to Rome, where he studied philosophy under Cornutus the celebrated Stoic. He also received the instructions of Palemon the grammarian, and Virginius the rhetorician. He distinguished himself by his satirical humour, and made the faults of the orators and poets of his age the subject of his poems. He did not even spare Nero, and the more effectually to expose the emperor to ridicule, he introduced into his satires some of his verses. Persius died in the 30th year of his age, A. D. 62. The satires of Persius are six in number, blamed by some for obscurity of style and of language. But though unintelligible to some, they were read with pleasure by his contemporaries, and the difficulties which now appear in them arise from their not knowing the various characters, the vices, and the errors which they censured.

PERSON. *s.* (*personne*, Fr. *persona*, Lat.) 1. Individual or particular man or woman. 2. Man or woman considered as opposed to things, or distinct from them (*Sprat*). 3. Individual; man or woman (*Pearson*). 4. Human being, considered with respect to mere corporal existence (*Dryden*). 5. Man or woman considered as present, acting or suffering (*Shakspeare*). 6. A general loose term for a human being; one; a man (*Clarissa*). 7. One's self; not a representative (*Dryden*). 8. Exterior appearance (*Shakspeare*). 9. Man or woman represented in a fictitious dialogue (*Baker*). 10. Character (*Hayward*). 11. Character of office (*South*). 12. (In grammar.) The quality of the noun that modifies the verb (*South*).

PERSON is defined by some metaphysicians, a distinct substance of a rational intelligent nature.

The word person, *persona*, is thought to be borrowed a *personando*, from personating or counterfeiting; and is supposed to have first signified a mask: because, as Boethius informs us, *in larva concava sonus volatur*: and hence the actors who appeared masked on the stage were sometimes called *larvati* and sometimes *personati*. He likewise says, that as the several actors represented each a single individual person, viz. *Œdipus*, or *Chremes*, or *Hecuba*, or *Medea*; for this reason, other people, who were at the same time distinguished by something in their form, character, &c. whereby they might be known, came likewise to be called by the Latins *personæ*, and by the Greeks

ὑποκρίματα. Again, as actors rarely represented any but great and illustrious characters, the word came at length to import the mind, as being that whose dispositions constitute the character. And thus men, angels, and even God himself, were called persons. Things merely corporeal, as a stone, a plant, or a horse, were called *hypostases* or *supposita*, but never persons. Hence the learned suppose, that the same name person came to be used to signify some dignity, whereby a person is distinguished from another: as a father, husband, judge, magistrate, &c. In this sense we are to understand that of Cicero: "Cæsar never speaks of Pompey but in terms of honour and respect: he does many hard and injurious things, however, against his person."

Person we have already defined to mean an individual substance of a reasonable nature. Now, a thing may be individual two ways: 1. Logically, because it cannot be predicated of any other; as Cicero, Plato, &c. 2. Physically; in which sense a drop of water, separated from the ocean, may be called an individual. Person is an individual nature in each of these senses: logically, according to Boethius, because person is not spoken of universals, but only of singulars and individuals; we do not say the person of an animal or a man, but of Cicero and Plato: and physically, since Socrates's hand or foot are never considered as persons. This last kind of individual is denominated two ways: positively, when the person is said to be the whole principle of acting; for, to whatever thing action is attributed, that the philosophers call a person: and negatively, as when we say, with the Thomists, &c. that a person consists in this, that it does not exist in another as a more perfect being. Thus a man, though he consists of two different things, viz. body and spirit, is not two persons; because neither part of itself is a complete principle of action, but one person, since the manner of his consisting of body and spirit is such as constitutes one whole principle of action; nor does he exist in any other as a more perfect being.

PERSONABLE. *a.* (from *person*.) 1. Handsome; graceful; of good appearance (*Raleigh*). 2. (In law.) One that may maintain any plea in a judicial court (*Ainsworth*).

PERSONAGE. *s.* (*personage*, French.) 1. A considerable person; a man or woman of eminence (*Sidney*). 2. Exterior appearance; air; stature (*Hayward*). 3. Character assumed (*Addison*). 4. Character represented (*Broome*).

PERSONAL. *a.* (*personel*, Fr. *personalis*, Latin.) 1. Belonging to men or women, not to things; not real (*Hooker*). 2. Affecting individuals or particular people; peculiar; proper to him or her; relating to one's private actions or character (*Rogers*). 3. Present; not acting by representative (*Shakspeare*). 4. Exterior; corporal (*Addison*). 5. (In law.) Something moveable; something appendant to the person, as money; not real, as land (*Davies*). 6. (In grammar.) A personal verb is that which has all the regular modifications

of the three persons; opposed to the impersonal, that has only the third.

PERSONALITY. *s.* (from *personal*.) The existence or individuality of any one (*Locke*).

PERSONALLY. *ad.* (from *personal*.) 1. In person; in presence; not by representative (*Hooker*). 2. With respect to an individual; particularly (*Bacon*). 3. With regard to numerical existence (*Rogers*).

PERSONATA. (from *persona*, a disguised person, because, according to Pliny, the ancient actors used to mask themselves with the leaves of this plant.) In botany, the great burdock. See **BARDANA**.

PERSONATE COROL. (*persona*, a mask.) In botany, a masked corol. Ringens, sed inter labia palato clausa. Ringent, but closed between the lips by the palate.—But surely ringent or gaping with the lips closed, is a contradiction in terms. It would better to define it, a species of labiate corol with the lips closed. See **LABIATE**.

Tournefort, from whom Linnéus adopted these terms, is clear and precise in his distinction. A labiate flower, according to him, is drawn out at bottom into a tube, and is widened at top either into one or two lips. The pistil becomes a fruit of four seeds ripening in the calyx as in a capsule: as in *salvia*, *horminum*, *marrubium*, *chamædryis*.—A personate flower differs from this in having the pistil becoming a capsule entirely distinct from the calyx. It has something of the same appearance as the labiate flower; but does not ill represent a mask, or the snout of some animals. This he exemplifies in *linaria*, *antirrhinum*, *pedicularis*, *melampyrum*.—There are some irregular monopetalous flowers which Linnéus includes under his ringents, that are neither the labiate nor personate of Tournefort: as *digitalis* and *scrophularia*.

TO PERSONATE. *v. a.* (from *persona*, Lat.) 1. To represent by a fictitious or assumed character, so as to pass for the person represented (*Bacon*). 2. To represent by action or appearance; to act (*Crashaw*). 3. To pretend hypocritically (*Swift*). 4. To counterfeit; to feign (*Hammond*). 5. To resemble (*Shakspeare*). 6. To make a representative of, as in picture: out of use (*Shakspeare*). 7. To describe: out of use (*Shakspeare*).

PERSONATION. *s.* (from *personate*.) Counterfeiting of another person (*Bacon*).

PERSONIFICATION. *s.* (from *personify*.) Prosopopœia; the change of things to persons: as, *Confusion* heard his voice.

TO PERSONIFY. *v. a.* (from *person*.) To change from a thing to a person.

PERSOONIA, in botany, a genus of the class tetrandria, order monogynia. Calyxless; petals four, bearing the stamens towards the base; glands four at the base of the germ; stigma obtuse; drupe one-seeded. Two species; Australasian plants, with linear or lanceolate leaves; and solitary, axillary flowers of a yellow hue.

PERSPECTIVE, the art of delineating visible objects on a plain surface, such as they ap-

pear at a given distance, or height, upon a transparent plane, placed commonly perpendicular to the horizon, between the eye and the object. This is particularly called

Linear perspective, as regarding the position, magnitude, form, &c. of the several lines, or contours of objects, and expressing their diminution.

Some make this a branch of optics; others an art and science derived from it: its operations however are all geometrical.

HISTORY OF PERSPECTIVE.—This art derives its origin from painting, and particularly from that branch of it which was employed in the decorations of the theatre, where landscapes were chiefly introduced. Vitruvius, in the proem to his 7th book, says that Agatharchus, at Athens, was the first author who wrote upon this subject, on occasion of a play exhibited by Æschylus, for which he prepared a tragic scene; and that afterwards the principles of the art were more distinctly taught in the writings of Democritus and Anaxagoras, the disciples of Agatharchus, which are not now extant.

The perspective of Euclid and of Heliodorus Larisseus contains only some general elements of optics, that are by no means adapted to any particular practice; though they furnish some materials that might be of service even in the linear perspective of painters.

Geminus, of Rhodes, a celebrated mathematician, in Cicero's time, also wrote upon this science.

It is also evident that the Roman artists were acquainted with the rules of perspective, from the account which Pliny (*Nat. Hist. lib. 35, cap. 4.*) gives of the representation on the scene of those plays given by Claudius Pulcher; by the appearance of which the crowds were so deceived, that they endeavoured to settle on the fictitious roofs. However, of the theory of this art among the ancients we know nothing; as none of their writings have escaped the general wreck of ancient literature in the dark ages of Europe. Doubtless this art must have been lost, when painting and sculpture no longer existed. However, there is reason to believe that it was practised much later in the Eastern empire.

John Tzetzes, in the 12th century, speaks of it as well acquainted with its importance in painting and statuary. And the Greek painters, who were employed by the Venetians and Florentines, in the 13th century, it seems brought some optical knowledge along with them into Italy: for the disciples of Giotto are commended for observing perspective more regularly than any of their predecessors in the art had done; and he lived in the beginning of the 14th century.

The Arabians were not ignorant of this art; as may be presumed from the optical writings of Alhazen, about the year 1100. And Vitellus, a Pole, about the year 1270, wrote largely and learnedly on optics. And, of our own nation, friar Bacon, as well as John Peckham, archbishop of Canterbury, treated this subject with surprising accuracy, considering the times in which they lived.

The first authors who professedly laid down rules of perspective were Bartolomeo Bramantino, of Milan, whose book, *Regole di Perspectiva, e Misure delle Antichità di Lombardia*, is dated 1440; and Pietro del Borgo, likewise an Italian, who was the most ancient author met with by Ignatius Danti, and who it is supposed died in 1443. This last writer supposed objects placed beyond a transparent tablet, and so to trace the images, which rays of light, emitted from them, would make upon it.

PERSPECTIVE.

And Albert Durer constructed a machine upon the principles of Borgo, by which he could trace the perspective appearance of objects.

Leon Battista Alberti, in 1450, wrote his treatise *De Pictura*, in which he treats chiefly of perspective.

Balthazar Peruzzi, of Siena, who died in 1536, had diligently studied the writings of Borgo; and his method of perspective was published by Serlio in 1540. To him it is said we owe the discovery of points of distance, to which are drawn all lines that make an angle of 45° with the ground line.

Guido Ubaldo, another Italian, soon after discovered, that all lines that are parallel to one another, if they be inclined to the ground line, converge to some point in the horizontal line; and that through this point also will pass a line drawn from the eye parallel to them. His perspective was printed at Pisaro in 1600, and contained the first principles of the method afterwards discovered by Dr. Brook Taylor.

In 1583 was published the work of Giacomo Barozzi, of Vignola, commonly called Vignola, intitled the two rules of perspective, with a learned commentary by Ignatius Danti. In 1615 Marolois' work was printed at the Hague, and engraved and published by Hondius. And in 1625, Sirigatti published his treatise of perspective, which is little more than an abstract of Vignola's.

Since that time the art of perspective has been gradually improved by subsequent geometricians, particularly by professor Gravesande, and still more by Dr. Brook Taylor, whose principles are in a great measure new, and far more general than those of any of his predecessors. He did not confine his rules, as they had done, to the horizontal plane only, but made them general, so as to affect every species of lines and planes, whether they were parallel to the horizon or not; and thus his principles were made universal. Besides, from the simplicity of his rules, the tedious progress of drawing out plans and elevations for any object, is rendered useless, and therefore avoided; for by this method, not only the fewest lines imaginable are required to produce any perspective representation, but every figure thus drawn will bear the nicest mathematical examination: Farther, his system is the only one calculated for answering every purpose of those who are practitioners in the art of design; for by it they may produce either the whole, or only so much of an object as is wanted; and by fixing it in its proper place, its apparent magnitude may be determined in an instant. It explains also the perspective of shadows, the reflection of objects from polished planes, and the inverse practice of perspective.

His *Linear Perspective* was first published in 1715; and his *New Principles of Linear Perspective* in 1719, which he intended as an explanation of his first treatise. And his method has been chiefly followed by all others since.

In 1738, Mr. Hamilton published his *Stereography*, in 2 vols. folio, after the manner of Dr. Taylor. But the neatest system of perspective, both as to theory and practice, on the same principles, is that of Mr. Kirby. There are also good treatises on the subject, by Desargues, de Bosse, Albertus, Lamy, Nicéron, Pozzo the Jesuit, Ware, Cowley, Priestly, Ferguson, Emerson, Malton, Henry Clarke, &c. &c. A new edition of Brook Taylor's *Perspective* has been recently published, as well as a very ingenious treatise founded on the same principles, by Mr. Creswell, of Trinity College, Cambridge.

Principles of perspective.—In order to understand the principles of perspective, it will be proper to consider the plane on which the representation is to be made as transparent, and interposed between the eye of the spectator and the object to be represented. Thus, suppose a person at a window looks through an upright pane of glass at any object beyond it, and, keeping his head steady, draws the figure of the object upon the glass with a black-lead pencil, as if the point of the pencil touched the object itself; he would then have a true representation of the object in perspective as it appears to his eye.

To this purpose two things are necessary: first, that the glass be laid over with strong gum-water, which, when dry, will be fit for drawing upon, and will retain the traces of the pencil; and, secondly, that he looks through a small hole in a thin plate of metal, fixed about a foot from the glass, between it and his eye, and that he keeps his eye close to the hole; otherwise he might shift the position of his head, and consequently make a false delineation of the object.

Having traced out the figure of the object, he may go over it again with pen and ink; and, when that is dry, put a sheet of paper upon it, and trace it thereon with a pencil: then taking away the paper, and laying it on a table, he may finish the picture by giving it the colours, lights, and shades, as he sees them in the object itself; and then he will have a true resemblance of the object.

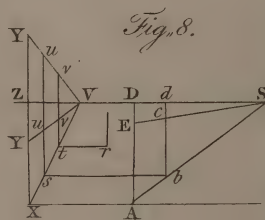
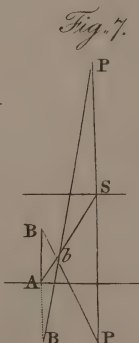
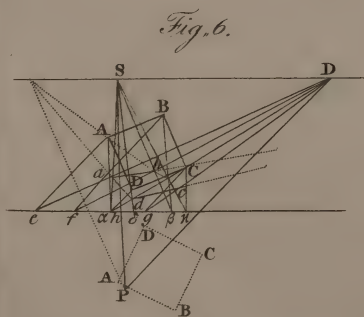
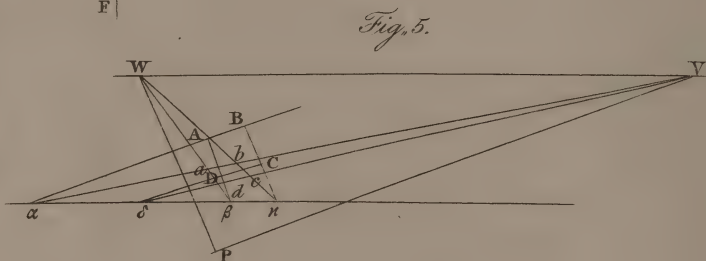
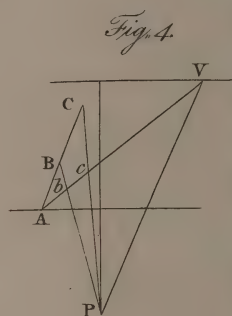
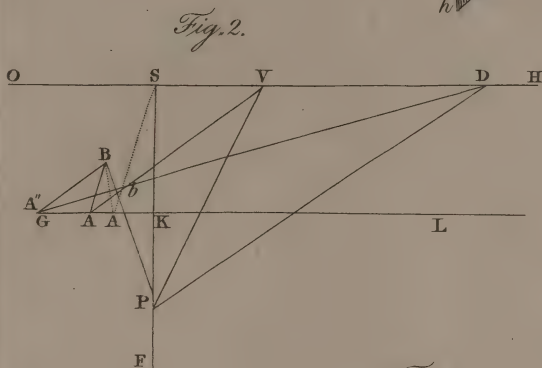
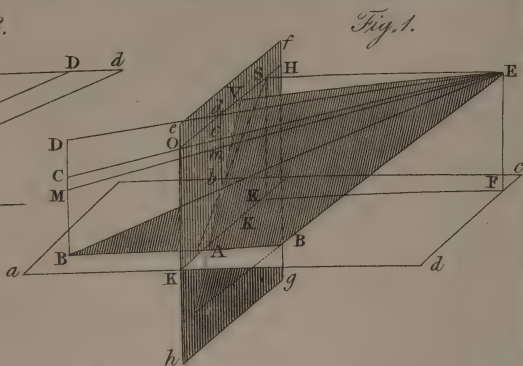
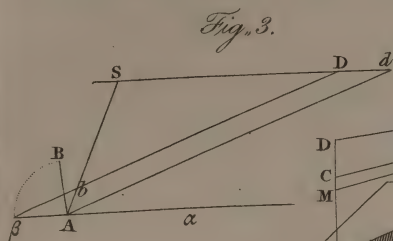
To every person who has a general knowledge of the principles of optics, this must be self-evident: for, as vision is occasioned by pencils of rays coming in straight lines to the eye from every point of the visible object, it is plain that, by joining the points in the transparent plane through which all those pencils respectively pass, an exact representation must be formed of the object, as it appears to the eye in that particular position, and at that determined distance; and were pictures of things to be always first drawn on transparent planes, this simple operation, with the principle on which it is founded, would comprise the whole theory and practice of perspective. As this, however, is far from being the case, rules must be deduced from the sciences of optics and geometry for drawing representations of visible objects on opaque planes; and the application of these rules constitutes what is properly called the art of perspective.

Previous to our laying down the fundamental principles of this art, it may not be improper to observe, that when a person stands right against the middle of one end of a long avenue or walk, which is straight and equally broad throughout, the sides thereof seem to approach nearer and nearer to each other as they are further and further from his eye; or the angles, under which their different parts are seen, become less and less according as the distance from his eye increases; and if the avenue be very long, the sides of it at the farthest end will seem to meet: and there an object that would cover the whole breadth of the avenue, and be of a height equal to that breadth, would appear only to be a mere point.

Having made these preliminary observations, we now proceed to the practice of perspective, which is built upon the following

Fundamental THEOREM I.

Let $a b c d$ (fig. 1. plate 134.) represent the ground-plan of the figure to be thrown into perspective, and $e f g h$ the transparent plane through



P E R S P E C T I V E.

which it is viewed by the eye at E. Let these planes intersect in the straight line kl . Let B be any point in the ground-plan, and BE a straight line, the path of a ray of light from that point to the eye. This will pass through the plane $efgh$ in some point b ; or B will be seen through that point, and b will be the picture, image, or representation of B.

If BA be drawn in the ground-plan, making any angle BAK with the common intersection, and E V be drawn parallel to it, meeting the picture-plane or perspective-plane in V, and VA be drawn, the point b is in the line VA so situated that BA is to EV as BA to bV .

For since EV and BA are parallel, the figure BAVEb is on one plane, cutting the perspective-plane in the straight line VA; the triangles BAb, EVb, are similar, and BA: EV = bA : bV .

Cor. 1.—If B be beyond the picture, its picture b is above the intersection kb ; but if B be between the eye and the picture, as at B', its picture b' is below kb .

2. If two other parallel lines BA', ES, be drawn, and A', S, be joined, the picture of B is in the intersection of the lines AV and A'S.

3. The line BA is represented by bA , or bA is the picture of BA; and if AB be infinitely extended, it will be represented by AV. V is therefore called the vanishing point of the line AB.

4. All lines parallel to AB are represented by lines converging to V from the points where these lines intersect the perspective-plane; and therefore V is the vanishing point of all such parallel lines.

5. The pictures of all lines parallel to the perspective-plane are parallel to the lines themselves.

6. If through V be drawn HVD parallel to kl , the angle EVH is equal to BAK.

Remark.—The proposition now demonstrated is not limited to any inclination of the picture-plane to the ground-plane: but it is usual to consider them as perpendicular to each other, and the ground plan as horizontal. Hence the line kl is called the ground-line, and OH the horizon-line; and VK perpendicular to both, is called the height of the eye.

If ES be drawn perpendicular to the picture-plane, it will cut it in a point S of the horizon-line directly opposite to the eye. This is called the point of sight, or principal point.

7. The pictures of all vertical lines are vertical, and the pictures of horizontal lines are horizontal, because these lines are parallel to the perspective-plane.

8. The point of sight S is the vanishing point of all lines perpendicular to the perspective-plane.

The above proposition is a sufficient foundation for the whole practice of perspective, whether of direct or inclined pictures, and serves to suggest all the various practical constructions, each of which has advantages which suit particular purposes. Writers on the subject have either confined themselves to one construction, from an affectation of simplicity or fondness for system; or have multiplied precepts, by giving every construction for every example, in order to make a great book, and give the subject an appearance of importance and difficulty. An ingenious practitioner will avoid both extremes, and avail himself of the advantage of each construction as it happens to suit his purpose. We shall now proceed to the practical rules, which require no consideration of intersecting planes, and are all performed on the perspective plane by means of certain substitutions for the place of the eye and the original figure. The general substitution is as follows:

Let the plane of the paper be first supposed to be the ground-plan, and the spectator to stand at F (fig. 2.) Let it be proposed that the ground-plan is to be represented on a plane surface, standing perpendicularly on the line GK of the plan, and that the point K is immediately opposite to the spectator, or that FK is perpendicular to GL: then FK is equal to the distance of the spectator's eye from the picture.

Now suppose a piece of paper laid on the plan with its straight edge lying on the line GL; draw on this paper KS perpendicular to GL, and make it equal to the height of the eye above the ground-plan. This may be much greater than the height of a man, because the spectator may be standing on a place much raised above the ground-plan. Observe also that KS must be measured on the same scale on which the ground-plan and the distance FK were measured. Then draw HSO parallel to GL. This will be a horizontal line, and (when the picture is set upright on GL) will be on a level with the spectator's eye, and the point S will be directly opposite to his eye. It is therefore called the principal point, or point of sight. The distance of his eye from this point will be equal to FK. Therefore make SP (in the line SK) equal to FK, and P is the projecting point or substitute for the place of the eye. It is sometimes convenient to place P above S, sometimes to one side of it on the horizontal line, and in various other situations; and writers, ignorant of or inattentive to the principles of the theory, have given it different denominations, such as point of distance, point of view, &c. It is merely a substitute for the point E in fig. 1. and its most natural situation is below, as in this figure.

The art of perspective is conveniently divided into ichnography, which teaches how to make a perspective draught of figures on a plane, commonly called the ground-plan; and scenography, which teaches how to draw solid figures, or such figures as are raised above this plan.

Fundamental Prob. 1.—To put into perspective any given point of the ground-plan.

First general construction.

From B and P (fig. 2.) draw any two parallel lines BA, PV, cutting the ground-line and horizon-line in A and V, and draw BP, AV, cutting each other in b ; b is the picture of B.

For it is evident that BA, PV, of this figure are analogous to BA and EV of fig. 1. and that BA: PV = bV .

If BA' be drawn perpendicular to GL, PV will fall on PS, and need not be drawn. AV' will be A'S.—This is the most easy construction, and is nearly the same with Ferguson's.

Second general construction.

Draw two lines BA, BA', and two lines PV, PD parallel to them, and draw AV, A'D, cutting each other in b ; b is the picture of B by Cor. 2.—This construction is the foundation of all the rules of perspective that are to be found in the books on this subject. They appear in a variety of forms, owing to the ignorance or inattention of the authors to the principles. The rule most generally adhered to is as follows:

Draw BA (fig. 3.) perpendicular to the ground-line, and AS to the point of sight, and set off A β equal to BA. Set off SD equal to the distance of the eye in the opposite direction from S that β is from A, where B and E of fig. 1. are on opposite sides of the picture; otherwise set them the same way. D is called the point of distance. Draw β D

PERSPECTIVE.

cutting AS in B. This is evidently equivalent to drawing BA and PS perpendicular to the ground-line and horizon-line, and B β and PD, making an angle of 45° with these lines, with the additional puzzle about the way of setting off A β and SD, which is avoided in the construction here given.

This usual construction, however, by a perpendicular and the point of distance, is extremely simple and convenient; and two points of distance, one on each side of S, serve for all points of the ground-plan. But the first general construction requires still fewer lines, if BA be drawn perpendicular to GL, because PV will then coincide with PS.

Third general construction.

Draw BA from the given point B perpendicular to the ground-line, and AS to the point of sight. From the point of distance D set off D d equal to BA, on the same or the contrary side as S, according as B is on the same or the contrary side of the picture as the eye. Join d , A, and draw D δ parallel to dA . b is the picture of B. For SD, D d , are equal to the distances of the eye and given point from the picture, and SD: D d = bS : bA .

This construction does not naturally arise from the original lines, but it is a geometrical consequence from their position and magnitude; and it is of all others the most generally convenient, as the perpendicular distances of any number of points may be arranged along SD without confusion, and their direct situations transferred to the ground-line by perpendiculars such as BA; and nothing is easier than drawing parallels, either by a parallel-ruler or a bevel-square, used by all who practise drawing.

PROB. 2.—To put any straight line BC (fig. 4. plate 134.) of the ground-plan in perspective.

Find the pictures b , c , of its extreme points by any of the foregoing constructions, and join them by the straight line bc .

Perhaps the following construction will be found very generally convenient.

Produce CB till it meet the ground-line in A, and draw PV parallel to it, and AV, and PB, PC, cutting AV in b , c . V is its vanishing point, by Cor. 3. of the fundamental theorem.

It must be left to the experience and sagacity of the drawer to select such constructions as are most suitable to the multiplicity of the figures to be drawn.

PROB. 3.—To put any rectilinear figure of the ground-plan in perspective.

Put the bounding lines in perspective, and the problem is solved.

The variety of constructions of this problem is very great, and it would fill a volume to give them all. The most generally convenient is to find the vanishing points of the bounding lines, and connect these with the points of their intersection with the ground-line. For example, to put the square ABCD (fig. 5.) into perspective.

Draw from the projecting point PV, PW, parallel to AB, BC, and let AB, BC, CD, DA, meet the ground-line in a , x , β , δ , and draw aV , δV , xW , βW , cutting each other in $a b c d$, the picture of the square ABCD. The demonstration is evident.

This construction, however, runs the figure to great distances on each side of the middle line when any of the lines of the original figure are nearly parallel to the ground-line.

The following construction (fig. 6.) avoids this inconvenience.

Let D be the point of distance. Draw the per-

pendiculars A a , B β , C γ , D δ , and the lines A e , B f , C g , D h , parallel to P.D. Draw S a , S β , S γ , S δ , and D e , D f , D g , D h , cutting the former in a , b , c , d , the angles of the picture.

It is not necessary that D be the point of distance, only the lines A e , B f , &c. must be parallel to PD.

Remark.—In all the foregoing constructions the necessary lines (and even the finished picture) are frequently confounded with the original figure. To avoid this great inconvenience, the writers on perspective direct us to transpose the figure; that is, to transfer it to the other side of the ground-line, by producing the perpendiculars A a , B β , C γ , D δ , till A A' , B B' , &c. are respectively equal to A a , B β , &c.; or, instead of the original figure, to use only its transposed substitute A'B'C'D'. This is an extremely proper method. But in this case the point P must also be transposed to P' above S, in order to retain the first or most natural and simple construction, as in fig. 7.; where it is evident that when BA=A'B', and SP=SP', and B'P' is drawn, cutting AS in b , we have bA : bS =B'A': P'S'=BA: PS, and b is the picture of B: whence follows the truth of all the subsequent constructions with the transposed figure.

PROB. 4.—To put any curvilinear figure on the ground-plan into perspective.

Put a sufficient number of its points in perspective by the foregoing rules, and draw a curve line through them.

It is well known that the conic sections and some other curves, when viewed obliquely, are conic sections or curves of the same kinds with the originals, with different positions and proportions of their principal lines, and rules may be given for describing their pictures founded on this property. But these rules are very various, unconnected with the general theory of perspective, and more tedious in the execution, without being more accurate than the general rule now given. It would be a useless affectation to insert them in this elementary treatise.

We come in the next place to the delineation of figures not in a horizontal plane, and of solid figures. For this purpose it is necessary to demonstrate the following

THEOREM II.

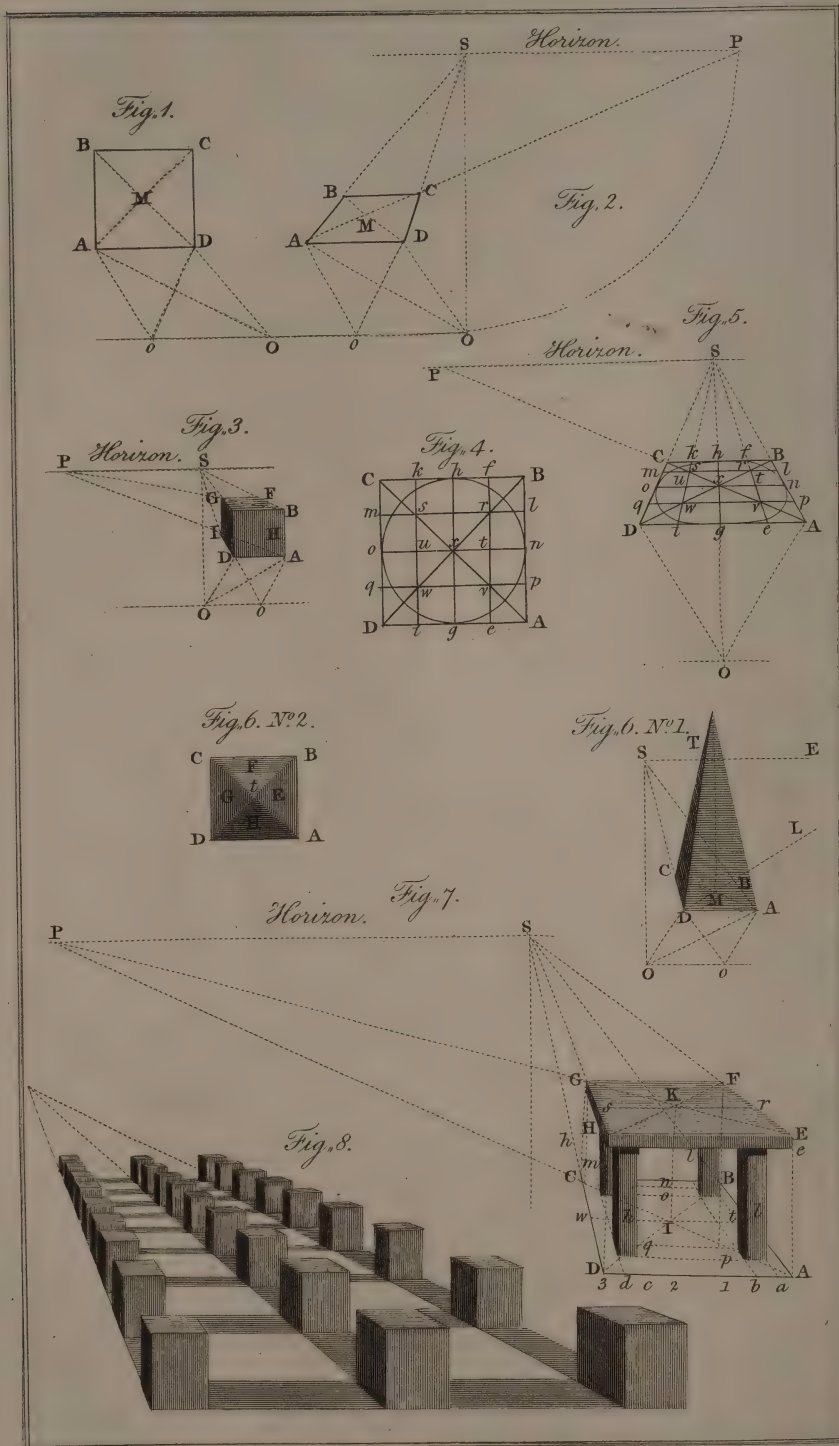
The length of any vertical line standing on the ground-plane is to that of its picture, as the height of the eye to the distance of the horizon-line from the picture of its foot.

Let BC be the vertical line standing on B, and let EF be a vertical line through the eye. Make BD equal to EF, and draw DE, CE, BE. It is evident that DE will cut the horizon-line in some point d , CE will cut the picture-plane in e , and BE will cut it in b , and that bc will be the picture of BC, and is vertical, and that BC is to bc as BD to bd , or as EF to bd .

Cor. The picture of a vertical line is divided in the same ratio as the line itself. For BC: BM = bc : bm .

PROB. 5.—To put a vertical line of a given length in perspective standing on a given point of the picture.

Through the given point b (fig. 8. plate 134.) of the picture, draw S b A from the point of sight, and draw the vertical line AD, and make AE equal to the length or height of the given line. Join ES, and draw bc parallel to AD, producing bc , when necessary, till it cut the horizontal line in d , and we have bc : bd =AD: AE, that is, as the



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length of the given line to the height of the eye, and $b d$ is the distance of the horizon-line from the point b , which is the picture of the root of the line. Therefore (Theor. 2.) $b c$ is the required picture of the vertical line.

This problem occurs frequently in views of architecture; and a compendious method of solving it would be peculiarly convenient. For this purpose, draw a vertical line XZ at the margin of the picture, or on a separate paper, and through any point V of the horizon-line draw VX . Set off XY , the height of the vertical line, and draw VY . Then from any points b, r , on which it is required to have the pictures of lines equal to XY , draw $bS, r t$, parallel to the horizon-line, and draw the verticals $Sz, t v$: these have the lengths required, which may be transferred to b and r . This, with the third general construction for the base points, will save all the confusion of lines which would arise from constructing each line apart.

PROB. 6.—To put any sloping line in perspective. From the extremities of this line, suppose perpendiculars making the ground-plane in two points, which we shall call the base points of the sloping line. Put these base points in perspective, and draw, by last problem, the perpendiculars from the extremities. Join these by a straight line. It will be the picture required.

PROB. 7.—To put a square in perspective, as seen by a person not standing right against the middle of either of its sides, but rather nearly even with one of its corners.

In fig. 1. plate 135. let $ABCD$ be a true square, viewed by an observer, not standing at o , directly against the middle of its side AD , but at O almost even with its corner D , and viewing the side AD under the angle AOD ; the angle AoD (under which he would have seen AD from o) being 60 degrees.

Make AD in fig. 2. equal to AD in fig. 1. and draw SP and OO parallel to AD . Then, in fig. 10. let O be the place of the observer's eye, and SO be perpendicular to SP ; then S shall be the point of sight in the horizon SP .

Take SO in your compasses, and set that extent from S to P : then P shall be the true point of distance, taken according to the foregoing rules.

From A and D draw the straight lines AS and DS ; draw also the straight line AP , intersecting DS in C .

Lastly, to the point of intersection C , draw BC parallel to AD ; and $ABCD$ in fig. 2. will be a true perspective representation of the square $ABCD$ in fig. 1. The point M is the centre of each square, and AMC and BMD are the diagonals.

PROB. 8.—To put a reticulated square in perspective, as seen by a person standing opposite to the middle of one of its sides.

A reticulated square is one that is divided into several little squares, like net-work, as fig. 4. each side of which is divided into four equal parts, and the whole surface into four times four (or 16) equal squares.

Having divided this square into the given number of lesser squares, draw the two diagonals AxC and BxD .

Make AD in fig. 5. equal to AD in fig. 11. and divide it into four equal parts, as $Ae, eg, g i$, and iD .

Draw SP for the horizon, parallel to AD , and, through the middle point g of AD , draw OS perpendicular to AD and SP . Make S the point of sight, and O the place of the observer's eye.

Take SP equal to SO , and P shall be the true point of distance.

Draw AS and DS to the point of sight, and AP to the point of distance, intersecting DS in C : then draw BC parallel to AD , and the outlines of the reticulated square $ABCD$ will be finished.

From the division points, e, g, i , draw the straight lines ef, gh, ik , tending towards the point of sight S ; and draw BD for one of the diagonals of the square, the other diagonal AC being already drawn.

Through the points r and s , where these diagonals cut ef and ik , draw lm parallel to AD . Through the centre point x , where the diagonals cut gh , draw no parallel to AD . Lastly, through the points v and w , where the diagonals cut ef and ik , draw $p q$ parallel to AD ; and the reticulated perspective square will be finished.

This square is truly represented, as if seen by an observer standing at O , and having his eye above the horizontal plane $ABCD$ on which it is drawn; as if OS was the height of his eye above that plane; and the lines which form the small squares within it have the same letters of reference with those in fig. 11. which is drawn as it would appear to an eye placed perpendicularly above its centre, x .

PROB. 9.—To put a circle in perspective.

If a circle be viewed by an eye placed directly over its centre, it appears perfectly round; but if it be obliquely viewed, it appears of an elliptical shape. This is plain by looking at a common wine glass set upright on a table.

Make a true reticulated square, as fig. 4. plate 135. of the same diameter as you would have the circle: and setting one foot of your compasses in the centre x , describe as large a circle as the sides of the square will contain. Then, having put this reticulated square into perspective, as in fig. 12. observe through what points of the cross lines and diagonals of fig. 11. the circle passes; and through the like points in fig. 12. draw the ellipsis, which will be as true a perspective representation of the circle, as the square in fig. 12. is of the square in fig. 11.

PROB. 10.—To put a cube in perspective, as if viewed by a person standing almost even with one of its edges, and seeing three of its sides.

In fig. 3. plate 135. let AB be the breadth of either of the six equal square sides of the cube AG : O the place of the observer, almost even with the edge CD of the cube, S the point of sight, SP the horizon parallel to AD , and P the point of distance taken as before.

Make $ABCD$ a true square; draw BS and CS to the point of sight, and BP to the point of distance, intersecting CS in G . Then draw FG parallel to BC , and the uppermost perspective square side $BFGC$ of the cube will be finished.

Draw DS to the point of sight, and AP to the point of distance, intersecting DS in the point I then draw GI parallel to CD ; and, if the cube be an opaque one, as of wood or metal, all the outlines of it will be finished; and then it may be shaded as in the figure.

But if you want a perspective view of a transparent glass cube, all the sides of which will be seen, draw AH toward the point of sight, FH parallel to BA , and HI parallel to AD : then $AHID$ will be the square base of the cube, perspectively parallel to the top $BFGC$; $ABFH$ will be the square side of the cube, parallel to $CGID$, and $FGHI$ will be the square side parallel to $ABCD$.

PROB. 11.—To put any solid in perspective.

Put the base of the solid, whatever it be, in perspective by the preceding rules. From each

PERSPECTIVE.

bounding point of the base, raise lines representing in perspective the altitude of the object; by joining these lines and shading the figure according to the directions in the preceding problem, you will have a scenographic representation of the object. This rule is general; but as its application to particular cases may not be apparent, it will be proper to give the following example of it.

PROB. 12.—To put a square pyramid in perspective, as standing upright on its base, and viewed obliquely.

In fig. 6. No. 1. of plate 135. let AD be the breadth of either of the four sides of the pyramid ATCD at its base ABCD; and MT its perpendicular height. Let O be the place of the observer, S his point of sight, SE his horizon, parallel to AD and perpendicular to OS; and let the proper point of distance be taken in SE produced toward the left hand, as far from S as O is from S.

Draw AS and DS to the point of sight, and DL to the point of distance, intersecting AS in the point B. Then, from B, draw BC parallel to AD; and ABCD shall be the perspective square base of the pyramid.

Draw the diagonal AC, intersecting the other diagonal BD at M, and this point of intersection shall be the centre of the square base.

Draw MT perpendicular to AD, and of a length equal to the intended height of the pyramid: then draw the straight outlines AT, CT, and DT; and the outlines of the pyramid (as viewed from O) will be finished; which being done, the whole may be so shaded as to give it the appearance of a solid body.

If the observer has stood at o, he could have only seen the side ATD of the pyramid; and two is the greatest number of sides that he could see from any other place of the ground. But if he were at any height above the pyramid, and had his eye directly over its top, it would then appear as in N^o. 2. and he would see all its four sides E, F, G, H, with its top t just over the centre of its square base ABCD; which would be a true geometrical and not a perspective square.

PROB. 13.—To put two equal squares in perspective, one of which shall be directly over the other, at any given distance from it, and both of them parallel to the plane of the horizon.

In fig. 7. plate 135. let ABCD be a perspective square on a horizontal plane, drawn according to the foregoing rules, S being the point of sight, SP the horizon (parallel to AD), and P the point of distance.

Suppose AD, the breadth of the square, to be three feet; and that it is required to place just such another square EFGH directly above it, parallel to it and two feet from it.

Make AE and DH perpendicular to AD, and two thirds of its length draw EH, which will be equal and parallel to AD; then draw ES and HS to the point of sight S, and EP to the point of distance P, intersecting HS in the point G: this done, draw FG parallel to EH; and you will have two perspective squares ABCD and EFGH, equal and parallel to one another, the latter directly above the former, and two feet distant from it; as was required.

By this method shelves may be drawn parallel to one another, at any distance from each other in proportion to their length.

PROB. 14.—To put a square table in perspective, standing on four upright square legs of any given length with respect to the breadth of the table.

In fig. 7. plate 135. let ABCD be the square

part of the floor on which the table is to stand, and EFGH the surface of the square table, parallel to the floor.

Suppose the table to be three feet in breadth, and its height from the floor to be two feet; then two thirds of AD or EH will be the length of the legs i and l ; the other two (l and m) being of the same length in perspective.

Having drawn the two equal and parallel squares ABCD and EFGH, as shown in prob. 13. let the legs be square in form, and fixed into the table at a distance from its edges equal to their thickness. Take Aa and Dd equal to the intended thickness of the legs, and a b and d c also equal thereto. Draw the diagonals AC and BD, and draw straight lines from the points a , b , c , d , towards the point of sight S, and terminating at the side BC. Then, through the points where these lines cut the diagonals, draw the straight lines n and o , p and q , parallel to AD: and you will have formed four perspective squares (like ABCD in fig. 6. N^o. 1.) for the bases of the four legs of the table: and then it is easy to draw the four upright legs by parallel lines, all perpendicular to AD; and to shade them as in the figure.

To represent the intended thickness of the table board, draw e h parallel to EH, and HG toward the point of sight S: then shade the spaces between these lines, and the perspective figure of the table will be finished.

PROB. 15.—To put three rows of upright square objects in perspective, equal in size, and at equal distances from each other, on an oblong square plane, the breadth of which shall be of any assigned proportion to the length thereof.

Fig. 8. plate 135. is a perspective representation of an oblong square plane, three times as long as it is broad, having a row of nine upright square objects on each side, and one of the same number in the middle; all equally high, and at equal distances from one another, both long-wise and cross-wise, on the same plane.

In fig. 1. plate 136. PS is the horizon, S the point of sight, P the point of distance, and AD (parallel to PS) the breadth of the plane.

Draw AS, NS, and DS, to the point of sight S; the point N being in the middle of the line AD: and draw DP to the point of distance P, intersecting AS in the point B: then, from B draw BC parallel to AD, and you have the perspective square ABCD.

Through the point i , where DB intersects NS, draw a e parallel to AD; and you will have subdivided the perspective square ABCD into four lesser squares, as A a i N, N i e D, a B k i, and i k C e.

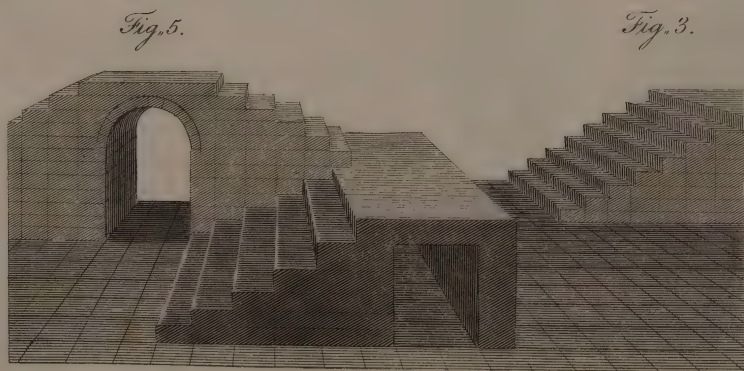
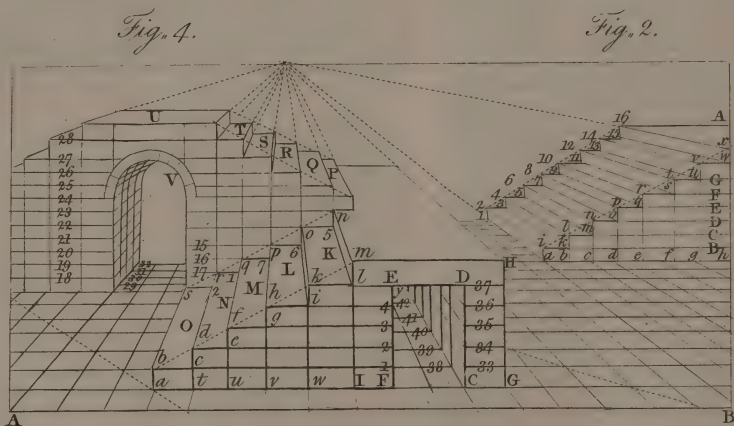
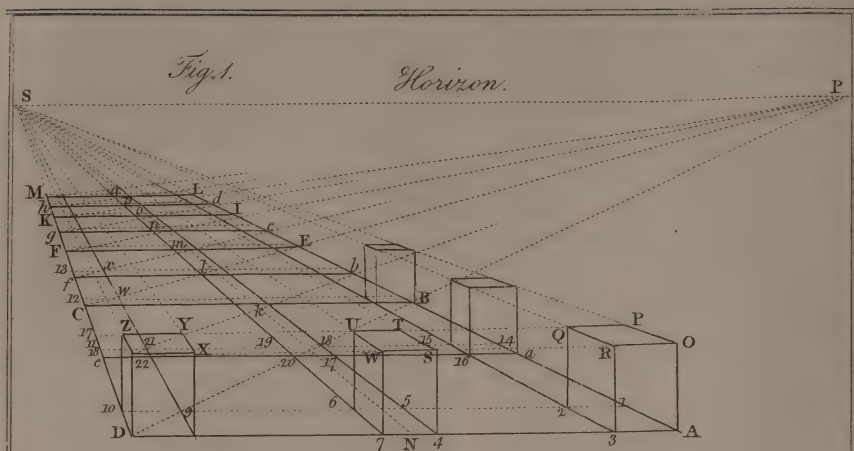
From the point C (at the top of the perspective square ABCD) draw CP to the point of distance P, intersecting AS in E; then, from the point E draw EF parallel to AD; and you will have the second perspective square BEFC.

Through the point l , where CE intersects NS, draw b f parallel to AD; and you will have subdivided the square BEFC into the four squares B b l k, k l f C, b E m l, and l m f f.

From the point F (at the top of the perspective square BEFC) draw FP to the point of distance P, intersecting AS in I; then from the point I draw IK parallel to AD, and you will have the third perspective square EIKF.

Through the point n , where FI intersects NS, draw c g parallel to AD; and you will have subdivided the square EIKF into four lesser squares, E e n m, m n g f, e I o n, and n o K g.

From the point K (at the top of the third per-



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spective square *EIKF* draw *KP* to the point of distance *P*, intersecting *AS* in *L*; then from the point *L* draw *LM* parallel to *AD*; and you will have the fourth perspective square *ILMK*.

Through the point *p*, where *KL* intersects *NS*, draw *dh* parallel to *AD*; and you will have subdivided the square *ILMK* into the four lesser squares *ldpo*, *opbk*, *dLqp*, and *pgmh*.

Thus we have formed an oblong square *ALMD*, whose perspective length is equal to four times its breadth, and it contains 16 equal perspective squares. If greater length was still wanted, we might proceed further on toward *S*.

Take *A 3*, equal to the intended breadth of the side of the upright square object *AQ* (all the other sides being of the same breadth), and *AO* for the intended height. Draw *O 18* parallel to *AD*, and make *D 8* and *4 7* equal to *A 3*; then draw *3 8*, *4 8*, *7 8*, and *8 8*, to the point of sight *S*; and among them we shall have the perspective square bases of all the 27 upright objects on the plane.

Through the point *9*, where *DB* intersects *8 8*, draw *1 10* parallel to *AD*, and you have the three perspective square bases *A 1 2 3*, *4 5 6 7*, *8 9 10*, of the three upright square objects at *A*, *N*, and *D*.

Through the point *21*, where *eb* intersects *8 8*, draw *14 11*, parallel to *AD*; and you will have the three perspective squares *a 14 15 16 17 18 19 20*, and *21 11 e 22* for the bases of the second cross-row of objects; namely, the next beyond the first three at *A*, *N*, and *D*.

Through the point *w*, where *CE* intersects *8 8*, draw a line parallel to *BC*; and you will have three perspective squares, at *B*, *k*, and *C*, for the bases of the third row of objects; one of which is set up at *B*.

Through the point *x*, where *fc* intersects *8 8*, draw a line parallel to *bf*; and you will have three perspective squares, at *b*, *l*, and *x*, for the bases of the fourth cross-row of objects.

Go on in this manner, as you see in the figure, to find the rest of the square bases, up to *LM*; and you will have 27 upon the whole oblong square plane, on which you are to place the like number of objects, as in fig. 8. plate 135.

Having assumed *AO* for the perspective height of the three objects at *A*, *N*, and *D* (fig. 1. plate 138.) next the observer's eye, and draw *O 18* parallel to *AD*, in order to make the objects at *N* and *D* of the same height as that at *O*; and having drawn the upright lines *4 15*, *7 8*, *X*, and *D 22*, for the heights *N* and *D*; draw *OS* and *RS*, *15 S* and *WS*, *XS* and *22 S*, all to the point of sight *S*; and these lines will determine the perspective equal heights of all the rest of the upright objects, as shown by the two placed at *a* and *B*.

To draw the square tops of these objects, equal and parallel to their bases, we need only give one example, which will serve for all.

Draw *3 R* and *2 Q* parallel to *AO*, and up to the line *RS*; then draw *PQ* parallel to *OR*, and *OPQR* shall be the top of the object at *A*, equal and parallel to its square base *A 1 2 3*.—In the same easy way the tops of all the other objects are formed.

When all the rest of the objects are delineated, shade them properly, and the whole perspective scheme will have the appearance of fig. 8. plate 135.

PROB. 16.—To put stairs with equal and parallel steps in perspective.

In fig. 2. of plate 136. let *a b* be the given breadth of each step, and *a i* the height thereof.

Make *bc*, *cd*, *de*, &c. each equal to *ab*; and draw all the upright lines *ai*, *bl*, *cn*, *dp*, &c. perpendicular to *ah* (to which the horizon *as* is parallel); and from the points *i*, *l*, *n*, *p*, *r*, &c. draw the equidistant lines *i B*, *l C*, *n D*, &c. parallel to *ah*; these distances being equal to that of *i B* from *uh*.

Draw *x i* touching all the corner-points *i*, *n*, *p*, *r*, *t*, *v*; and draw *2 16* parallel to *x i*, as far from it as you want the length of the steps to be.

Toward the point of sight *S* draw the lines *a 1*, *i 2*, *k 3*, *l 4*, &c. and draw *16 15*, *14 13*, *12 11*, *10 9*, *8 7*, *6 5*, *4 3*, and *2 1*, all parallel to *ah*, and meeting the lines *w 15*, *u 13*, *s 11*, &c. in the points *15*, *13*, *11*, *9*, *7*, *5*, *3*, and *1*: then from these points draw *15 14*, *13 12*, *11 10*, *9 8*, *7 6*, *5 4*, and *3 2*, all parallel to *ha*; and the outlines of the steps will be finished. From the point *16*, draw *16 A* parallel to *ba*, and *A x 16* will be part of the flat at the top of the uppermost step. This done, shade the work as in fig. 3, and the whole will be finished.

PROB. 17.—To put stairs with flats and openings in perspective, standing on a horizontal pavement of squares.

In fig. 4. plate 136. having made *S* the point of sight, and drawn a reticulated pavement *AB* with black-lead lines, which may be rubbed out again; at any distance of the side *AB* of the pavement which is nearest to the eye, and at any point where you choose to begin the stair at that distance, as *a*, draw *G a* parallel to *BA*, and take *a b* at pleasure for the height of each step.

Take *a b* in your compasses, and set that extent as many times upward from *F* to *E* as is equal to the first required number of steps *O*, *N*, *M*, *L*, *K*; and from these points of division in *EF* draw *1 b*, *2 d*, *3 f*, *4 h*, and *E k*, all equidistant from one another, and parallel to *F a*: then draw the equidistant upright lines *a b*, *td*, *uf*, *vh*, *w k*, and *I m*, all perpendicular to *F a*; then draw *m b*, touching the outer corners of these steps at *m*, *k*, *h*, *f*, *d*, and *b*; and draw *ns* parallel to *m b*, as far from it as you want the length of the steps *K*, *L*, *M*, *N*, *O* to be.

Towards the point of sight *S* draw *m n*, *l 5*, *k o*, *i 6*, *hp*, *f q*, *d r*, and *bs*. Then (parallel to the bottom line *BA*) through the points *n*, *o*, *p*, *q*, *r*, *s*, draw *n 8*; *5 14*; *6 15*; *7 16*; *1 17*; and *2 s*: which done, draw *n 5* and *o 6* parallel to *lm*, and the outlines of the steps *K*, *L*, *M*, *N*, *O* will be finished.

At equal distances with that between the lines marked *8* and *14*, draw the parallel lines above marked *9 10*, *11 12* and *13*; and draw perpendicular lines upwards from the points *n*, *o*, *p*, *q*, *r*, *s*, as in the figure.

Make *H m* equal to the intended breadth of the flat above the square opening at the left hand, and draw *HW* toward the point of sight *S*, equal to the intended length of the flat; then draw *WP* parallel to *H m*, and the outlines of the flat will be finished.

Take the width of the opening at pleasure, as from *F* to *C*, and draw *CD* equal and parallel to *FE*. Draw *GH* parallel to *CD*, and the short lines marked *33 34*, &c. just even with the parallel lines *1 2*, &c. From the points where these short lines meet *CD* draw lines toward the point of sight *S* till they meet *DE*; then from the points where the lines *33 39*, *40*, &c. of the pavement meet *C y*, draw upright lines parallel to *CD*, and the lines which form the opening will be finished.

The steps *P*, *Q*, *R*, *S*, *T*, and the flat *U* above

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the arch V, are done in the same manner with those in fig. 2. as taught in prob. 16. and the equidistant parallel lines marked 18, 19, &c. are directly even with those on the left hand side of the arch V, and the upright lines on the right-hand side are equidistant with those on the left.

From the points where the lines 18, 19, 20, &c. meet the right-hand side of the arch, draw lines toward the point of sight S; and from the points where the pavement lines 29, 30, 31, 32, meet the line drawn from A towards the point of sight, draw upright lines toward the top of the arch.

Having done the top of the arch, as in the figure, and the few steps to the right hand thereof, shade the whole as in fig. 5. and the work will be finished.

By drawing these examples frequently over, to a large scale, and reflecting upon them with attention, the student will become familiar with their use; and as they include the cases which most frequently occur, he will necessarily find great benefit from the knowledge of them.

The practical part of perspective is only the application of these rules to the actual description of objects. But as this part is purely mathematical, its assistance towards drawing is alone what can be performed by rule and compass, and can therefore strictly serve only for finding the images of points, of which they are composed; and, as these are infinite, it is endless to find them all by the strict rules; whence it becomes necessary after a sufficient number of them are found, to complete the image by the help of drawing, to the better effecting of which these points serve as a guide. Thus, when a circle is to be described, the practical rules serve to find a sufficient number of points in the circumference; which, being neatly joined by hand, will perfect the image, so that, in strictness, nothing in this image is found by mathematical rules, save the few particular points; the rest owes its being to the hand of the drawer.

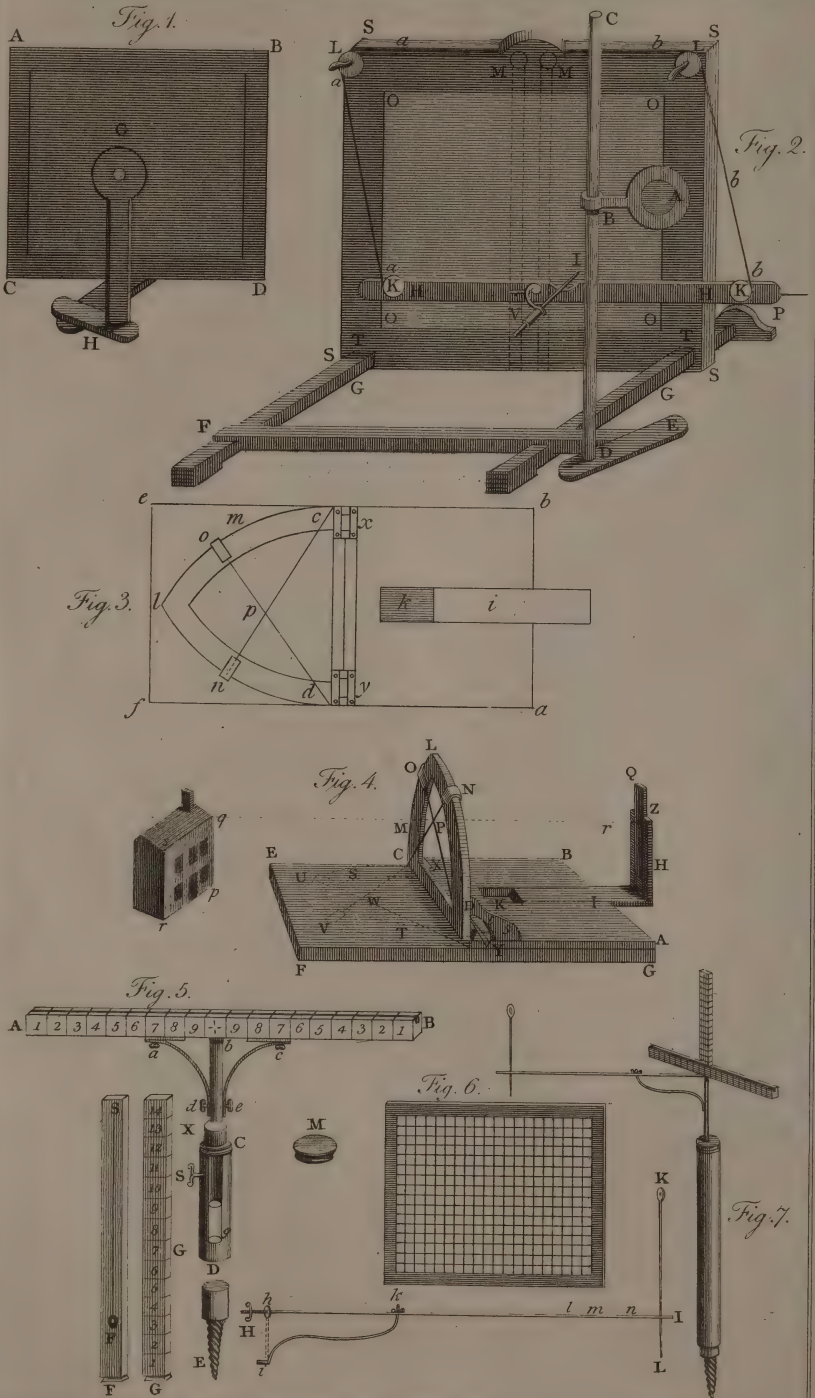
Thus, also, if any complicated figure is proposed, it may not be easy to apply the practical rules to the description of every minute part: but by inclosing that figure in a regular one, properly subdivided and reduced into perspective, that will serve as a help, whereby a person skilled in drawing may with ease describe the object proposed. Upon the whole, where the boundaries of the proposed objects consist of straight lines and plane surfaces, they may be described directly by the rules of perspective; but when they are curvilinear, either in their sides or surfaces, the practical rules can only serve for the description of such right-lined cases as may conveniently inclose the objects, and which will enable the designer to draw them within those known bounds with a sufficient degree of exactness.

It is therefore in vain to seek, by the practical rules of perspective, to describe all the little hollows and prominences of objects, the different light and shades of their parts, or their smaller windings and turnings; the infinite variety of the folds in drapery; of the boughs and leaves of trees, or the features and limbs of men and animals; much less to give them that roundness and softness, that force and spirit, that easiness and freedom of posture, that expression and grace, which are requisite to a good picture. Perspective must content itself with its peculiar province of exhibiting a kind of rough draught to serve as a ground-work, and to ascertain the general proportions and places of the objects, according to their supposed situations; leaving the rest to be finished, beautified, and ornamented, by a hand skilful in drawing,

It is true, perspective is of most use where it is most wanted, and where a deviation from its rules would be the most observable; as in describing all regular figures, pieces of architecture, and other objects of that sort, where the particular tendency of the several lines is most remarkable; the rule and compass in such cases being much more exact than any description made by hand: but still the figure, described by the perspective rules, will need many helps from drawing; the capitals, and other ornaments of pillars, and their entablatures, the strength of light and shade, the apparent roundness and protuberance of the several parts, must owe their beauty and finishing to the designer's hand; but with regard to such objects as have no constant and certain determinate shape or size, such as clouds, hills, trees, rivers, uneven grounds, and the like, there is a much larger latitude allowable, provided the general bulk, or usual natural shape of those objects, are in some measure observed, so as not to make them appear unnatural or monstrous. See DRAWING.

But although the strict practical rules of perspective are in a great measure confined to the description of right-lined figures, yet the knowledge of the general laws of that science is of great and necessary use to inform the judgment, after what manner the images of any proposed lines should run, which way they should tend, and where terminate; and thereby enables it the better to determine what appearance any objects ought to put on, according to their different situations and distances; it accustoms the eye to judge with greater certainty of the relations between real objects and their perspective descriptions, and directs the hand to draw the same accordingly; and directs the judgment readily to discover any considerable error therein which might otherwise escape notice. Besides that, when the ground, or general plan, and the principal parts of a picture, are first laid down according to the rules, every thing else will more naturally fall in with them, and every remarkable deviation from the just rules will be the more readily perceived, and the easier avoided or rectified; so that although it may be infinitely tedious, or absolutely impracticable, to describe every minute part of a picture by the strict mechanical rules, yet the employing them, where they can be the most commodiously used, will give the picture in general such a look, as will guide the artist in drawing the other parts without any obvious inconsistency.

When a painter has formed a scene in his mind, and supposed, as it is customary, that the capital figures of this scene lie close, or almost close, to the back of his canvass, he is, in the next place, to fix upon some point on this side of the canvass, from which he would choose his piece should be seen. But in choosing this point, which is called the point of sight, regard should be had to its situation to the right or left of the middle of the canvass: but, above all things, to its distance and its height with respect to the lower edge of the canvass; which edge is called the base-line, and is parallel with the horizontal line that passes through the eye. For by assuming the point of sight, and consequently the horizontal line, too low, the planes upon which the figures stand will appear a great deal too shallow; as, by assuming it too high, they will appear too steep, so as to render the piece far less light and airy than it ought to be. In like manner, if the point of sight is taken at too great a distance from the canvass, the figures will not admit of degradation enough to be seen with suffi-



Muslow & Co. Pat. 1812.

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cient distinctness; and if taken too near it, the degradation will be too quick and precipitate to have an agreeable effect. Thus, then, it appears, that no small attention is requisite in the choice of this point.

When a picture is to be placed on high, the point of sight should be assumed low, and *vice versa*; in order that the horizontal line of the picture may be, as near as possible, in the same horizontal plane with that of the spectator; for this disposition has an amazing effect. When a picture is to be placed very high, as, amongst many others, that of the Purification by Paolo Veronese, engraved by Le Fevre, it will be proper to assume the point of sight so low, that it may lay quite under the picture, no part of whose ground is, in that case, to be visible; for, were the point of sight to be taken above the picture, the horizontal ground of it would appear sloping to the eye, and both figures and buildings as ready to tumble head foremost. It is true, indeed, that there is seldom any necessity for such extraordinary exactness; and that unless in some particular cases, the point of sight had better be rather high than low: the reason of which is, that, as we are more accustomed to behold people on the same plane with ourselves, than either higher or lower, the figures of a piece must strike us most when standing on a plane nearly level with that upon which we ourselves stand. To this it may be added, that by placing the eye low, and greatly shortening the plane, the heels of the back figures will seem to bear against the heads of the foremost, so as to render the distance between them far less perceptible than otherwise it would be.

The point of sight being fixed upon according to the situation in which the picture is to be placed, the point of distance is next to be determined. In doing this, a painter should carefully attend to three things: first, that the spectator may be able to take in, at one glance, the whole and every part of the composition; secondly, that he may see it distinctly; and thirdly, that the degradation of the figures and other objects of the picture be sufficiently sensible.

But there is a particular still remaining, which will not admit of the least latitude. This is the delineation of the picture, when once the point of sight has been fixed upon. The figures of a picture are to be considered as so many columns erected on different spots of the same plane; and the painter must not think of designing any thing, till he has laid down, in perspective, all those columns which are to enter his composition, with the most scrupulous exactness. By proceeding in this manner, he may not only be sure of not committing any mistake in the diminution of his figures according to their different distances, but may flatter himself with the thoughts of treading in the steps of the greatest masters. It is to the punctual observance of these laws that we are to attribute the grand effect of some paintings by Carpa-zio and Mantegna, so careless in other respects; whereas a single fault against them is often sufficient entirely to spoil the works of a Guido, in spite of the sublimity and beauty of his superior style.

PERSPECTIVE (Aerial), is the art of giving a due diminution or degradation to the strength of the light, shade, and colours of objects, according to their different distances, the quantity of light which falls on them, and the medium through which they are seen.

As the eye does not judge of the distance of objects entirely by their apparent size, but also by

their strength of colours, and distinction of parts; so it is not sufficient to give an object its due apparent bulk according to the rules of stereography unless at the same time it be expressed with that proper faintness and degradation of colour which the distance requires. Thus if the figure of a man, at a distance, were painted of a proper magnitude for the place, but with too great a distinction of parts, or too strong colours, it would appear to stand forward, and seem proportionally less, so as to represent a dwarf situated nearer the eye, and out of the plane on which the painter intended it should stand.

By the original colour of an object is meant that colour which it exhibits to the eye when duly exposed to it in a full open uniform light, at such a moderate distance as to be clearly and distinctly seen. This colour receives an alteration from many causes, the principal of which are the following.

1. From the objects being removed to a greater distance from the eye, whereby the rays of light which it reflects are less vivid, and the colour becomes more diluted and tinged, in some measure, by the faint bluish cast, or with the dimness or haziness of the body of air through which the rays pass.

2. From the greater or less degree of light with which the object is enlightened; the same original colour having a different appearance in the shades, from what it has in the light, although at an equal distance from the eye, and so in proportion to the strength of the light or shade.

3. From the colour of the light itself which falls upon it, whether it be from the reflection of coloured light from any adjacent object, or by its passage through a coloured medium, which will exhibit a colour compounded of the original colour of the object, and the other accidental colours which the light brings with it.

4. From the position of the surface of the object, or of its several parts with respect to the eye; such parts of it appearing more lively and distinct than those which are seen obliquely.

5. From the closeness or openness of the place where the object is situated; the light being much more variously directed and reflected within a room than in the open air.

6. Some original colours naturally reflect light in a greater proportion than others, though equally exposed to the same degrees of it; whereby their degradation at several distances will be different from that of other colours which reflect less light.

PERSPECTIVE MACHINES, or contrivances for designing or drawing in perspective, are of various kinds. We shall here describe three or four of the most useful. See also CAMERA OBSCURA and LUCIDA.

Provide a square piece of glass fitted into a frame ABDC (fig. 1, pl. 137); and wash and smear it over with water in which a little gum has been dissolved. When it is well dried again, turn it towards the object or objects to be designed, so that the whole may be seen through a dioptra or sight, GH. Then applying the eye to the sight, with a pen and ink draw every thing on the glass, as you see it appear thereon: or the outlines of the objects may be drawn with black colour in drying oil. Having finished the draught, lay a fair moist paper thereon; and, pressing it pretty tight down, the whole will be transferred from the glass to the paper. This method is very good, easy, and exact, and deserves to be more used by painters. Some have used a piece of tiffany or fine lawn; and others, paper made transparent by means of oil of

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the shape of very little drops adhering to the epidermis. The secretory organ is composed of the extremities of the cutaneous arteries. The smell of the perspirable fluid, in an healthy man, is fatuous and animal; its taste manifestly salt and ammoniacal. In consistence it is vaporous and aqueous; and its specific gravity is greater than water. For the most part it is yellowish, from the passage of the subcutaneous oil, and sebaceous matter of the subcutaneous glands. Sometimes it is reddish, from the globules of the cruor passing through, especially under the axillæ. The quantity is sometimes so profuse, as not only conspicuously to moisten the linen, but also the thicker garments. The cutaneous arteries from which the perspirable matter is secreted are easily shown by injecting water or isinglas into the arteries; for then, from all parts of the skin, an infinite number of small drops exude, which being effused under the cuticle, rendered impervious by death, raise it up in blisters.

During life, this exhalation is demonstrated in many ways. A bright mirror, when held near the warm and naked skin, is quickly obscured by a moist vapour. In subterraneous caverns, where the air is denser, it most evidently escapes in the air, from the whole surface of the body, in the form of visible and thick clouds.

In man, and in some, though not in all animals, whenever the motion of the blood is increased, while at the same time the skin is hot and relaxed, from the small cutaneous pores, instead of an invisible vapour, sweat exudes in the form of minute, but visible drops, which, with others of the same kind, run together into larger drops. The hottest parts are most subject to sweat, as the head, breast, and folds of the body. The experiment before mentioned, together with the simplicity of nature, the visible density of the cutaneous and pulmonary exhalation, persuades us, that sweat is discharged through the same vessels which are the organs of perspiration, and that it differs only in its quantity and celerity, and by the admixture of the liquor of the sebaceous glands, and the subcutaneous oil, which being diluted by the more plentifully secreted arterial fluid, exude of an oily and yellow consistence, and chiefly cause the smell and colour of the sweat. Hence, it is more fetid and yellower in the armpits and groins, where those glands are most numerous. Both blood and small sand have escaped from the skin along with the sweat.

The nature of perspiration must be investigated by experiments, and by its analogy with the pulmonary exhalation, which, in like manner, but more frequently, becomes visible in a cold air. That this exhalation is chiefly water, has been proved by experiments, in which the breath, being received into large vessels, has condensed into watery drops. This is confirmed by the tenuity of the cloud on the mirror, and its volatility, and by the familiar change of the perspired matter, when obstructed, into a diuresis or diarrhœa, and from the easy determination of warm liquors to assume the

form of perspiration by heat, or of urine by cold. This water is derived from our drink, which furnishes a great part of the perspiration, and from inhalation. Frequently, even the odours of our aliments may be plainly perceived in the perspiration; there is also an admixture of the electrical matter in every person, and in some it is evidently lucid.

That it also contains some volatile particles of an alkaline nature is evident, both from the nature of our blood, and from the considerable evils which succeed the retention of the perspiration, most conspicuously in acute diseases, when, by being repelled inward, it renders the urine pale, and from the corruption of the air by respiration. This volatile alkaline matter arises from the particles of the blood, attenuated by perpetual heat and trituration, and changed into an acrimonious nature. Dogs trace these odours, and could not know their masters unless something of a particular nature were perspired from each person.

The quantity of matter perspired is very large, whether we consider the extent of the organ secreting it, the quantity of vapour exhaled by the lungs alone, or the experiments of Sanctorius, by which it would seem, that of eight pounds of food and drink, five pounds, or according to other experiments in a colder country, from fifty-six to thirty ounces are perspired, which neither add to the weight of the body, nor escape by any visible excretion except the saliva, sweat, and mucus of the nose. But the cutaneous exhalation is even much larger than this; since it not only throws off such a proportion of the alimentary matters, but likewise redischarges what the blood requires by inhalation. In this, however, the different states of the air, and of the body, have great influence. In warm countries, in the summer-months, and in young active persons, more goes off by perspiration, and less by the urine. But in cold climates, during the temperate and winter seasons, in aged or inactive persons, more goes off by the urine than by the insensible perspiration. In temperate countries, making a computation throughout the whole year, something more is perspired than what passes off by urine; and, by collating all the experiments made in different countries, both excretions are almost alike. It is also somewhat affected by the difference of time after eating; and the law which seems to obtain, is, that the perspiration is most copious at that time when the alimentary matters, being mostly digested, and received into the blood, are fitted for exhalation. It is naturally diminished during sleep, even in the warmest climates; but it is increased by the heat of the bed-clothes.

In general a plentiful and equable perspiration, at the same time that the body is strong, are good signs of health; for excessive perspiration, when conjoined with debility, is observed to do more mischief than its entire suppression, if what has been written on this subject is sufficiently to be depended on. It is a sign of health, because it denotes the perviousness of the vessels dispersed throughout

PERSPIRATION.

the whole body, and the complete digestion of the aliments, of which a great part is resolved into halitus. When it is diminished, it indicates constriction of the skin, weakness of the heart, and imperfect digestion. When excessive, it perhaps wastes the nervous spirits. This discharge is, by moderate exercise, increased to six times that of a person at rest, to the extent of a pound in an hour, or even in half an hour. It is farther increased, if aided by strong and open vessels, by warm, watery, and cordial drinks, by food of easy digestion, by a dense and temperate atmosphere, and by cheerfulness. It is diminished or suppressed by the contrary causes; as a dense skin, a moist, or a cold and dry atmosphere, rest, an increased flow of urine, the supervention of a diarrhoea; and lastly, nervous agitation, from a disagreeable affection of the mind. However, the continuance of life does not depend so intimately on this discharge which is so easily, and without bad consequences, increased or diminished by slight causes; and is so inconsiderable, in many nations, anointing their skins with oil, and in many animals. When by being suppressed, it produces such bad effects in fevers of a bad kind, it hurts chiefly by the putrescent particles, which are retained by the perspiration being suppressed.

The sweat is evidently of a saline nature; as appears both from its taste and from the crystals which form upon the clothes of glass-blowers; and by distillation, which demonstrates its alkaline nature. Hence, by this discharge, the miasms of the most pestilential diseases are frequently expelled. But, in reality, sweat is always a preternatural discharge, and ought never to exist in a healthy person, unless by violent bodily exercise he have induced a temporary disease. It also is frequently injurious in acute diseases; by wasting the water of the blood, so that the rest becomes thicker, and the salts more acrimonious. By violent exercise, or the heat of the climate, the sweat is extremely fetid; and even sanguineous: being electrical, it sometimes is lucid.

The uses of perspiration are, to free the blood of its redundant water, of its alkaline impurities, rendered more acrid by repeated circulations; and of an extremely volatile oil, probably prepared from the same blood. The same perspiration likewise qualifies and softens the cuticle, and preserves the necessary softness of the papillæ.

But the same skin, which has vessels exhaling into the air, is likewise replenished with vessels, which absorb thin vapours from the air, either perpetually, or at least in a moderate degree of cold; in a moist atmosphere; in the night-time, when the body is at rest, the mind depressed, and under circumstances, contrary to those mentioned above, which increase perspiration. These veins are demonstrated by anatomical injections, which, if thin or watery, exude through them in the same manner as through the arteries: moreover, by the manifest operations of medicines, diffused in the air, or applied to the skin: of vapours, mercury, turpentine, saffron; of baths, mercurial plas-

ters, tobacco, coloquintida, opium, cantharides; arsenic; by the fatal effects of poisons, absorbed by the skin; as the venereal poison; by the living of animals, without drink, in hot but humid islands; by the perspiration and urine being sufficiently copious in such situations, without much drink; and lastly, by extraordinary morbid cases, in which the quantity of urine discharged has far exceeded the drink taken in; in which it is probable, that the inhaling pores were more open; for that new ones were generated, is not credible. It is difficult to ascertain its quantity; that it is very great in plants in the night-time, is proved by certain experiments.

Both the exhaling and inhaling vessels may be contracted and relaxed by the nervous power. This appears from the effects of the passions of the mind; which, if lively and exhilarating, relax the exhaling vessels, by increasing the impulse of the influx of blood; and by the remission of the nerves; hence redness, moisture, and turgescence of the skin. Those passions which are languid and depressing contract the exhaling vessels; as appears from the dryness of the skin, produced by them; from the goose-skin, by terror; and from diarrhoea, caused by fear. They also seem to dilate the inhaling vessels, whence fear facilitates the action of the small-pox and the plague.

The constituent principles of the perspirable fluid appear to be, 1. Water, attenuated into vapour, by the matter of heat. 2. Animal gas, or carbonated hydrogen. As the production of carbonated air with the oxygen of the atmosphere shews. 3. Azotic gas. For water in which a man has bathed soon becomes putrid. Carbonated hydrogen, chemically combined with azot, would appear to constitute putrid miasm. May not this be the origin of putrid fever, in those narrow confined chambers in which there are many persons? 4. The glandular smegma and subcutaneous oil; hence linen is stained with a yellowish colour, and leanness is brought on. 5. The serum of the blood. This affords an immense quantity of water, and the albuminous and saline part of the sweat. It makes the linen of a viscid rigidity, and of a salt taste. Glass-blowers sometimes excrete so acrid a sweat, that salt has been seen collected in crystals on their faces.

Perspiration varies in respect to, 1. The temperature of the atmosphere. Thus men have a more copious, viscid, and higher coloured sweat on summer days, and in warm countries, than in colder regions. 2. Sex. The sweat of a man is said to smell more acrid than that of a woman. 3. Age. The young are more subject to sweat than the aged, who during the excessive heat of the summer scarcely sweat at all. 4. Ingesta. An alliacious sweat is perceived from eating garlic; a leguminous from peas; an acid from acids; a fetid from animal food only; and a rancid sweat from fat foods, as is observed in Greenland. A long abstinence from drink causes a more acrid and coloured sweat; and the drinking a great quantity of cold water in summer, a limpid and thin sweat. 5. Medicines. The sweat of those

who have taken musk, even moderately, and assafoetida, or sulphur, smells of their respective natures. 6. Region of the body. The sweat of the head is greasy; on the forehead it is more aqueous; under the axillæ very unguinous; and in the interstices of the toes it is very fetid, forming in the most healthy man blackish sordes. 7. Diseases. In this respect it varies very much, in regard to quantity, smell, and colour; for the sweat of gouty persons is said to turn vegetable juices to a red colour, and is of a cretaceous nature. Some men also have a lucid sweat, others a sweat tinging their linen of a carulean colour.

The uses of the insensible perspiration are, 1. To liberate the blood from superfluous animal gass, azot, and water. 2. To eliminate the noxious and heterogeneous excrements; hence the acid, rancid, leguminous, or putrid perspiration of some men. 3. To moisten the external surface of the body, lest the epidermis, cutis, and its nervous papillæ be dried up by the atmospheric air. 4. To counter-balance the suppressed pulmonary transpiration of the lungs; for when it is suppressed, the cutaneous is increased: hence the nature of both appears to be the same.

The use of the sensible perspiration or sweat, in an healthy man, is scarcely observable, unless from an error of the six non-naturals. Its first effect on the body is always prejudicial, by exhausting and drying it; although it is sometimes of advantage. 1. By supplying a watery excretion: thus when the urine is deficient, the sweat is often more abundant. In this manner an aqueous diarrhoea is frequently cured by sweating. 2. By eliminating at the same time any morbid matter. Thus various miasms are critically expelled, in acute and chronic diseases, with the sweat.

PERSPIRATIVE. *a.* (from *perspire*.) Performing the act of perspiration.

To PERSPIRE. *v. n.* (*perspiro*, Latin.) 1. To perform excretion by the cuticular pores. 2. To be excreted by the skin (*Arbutnot*).

To PERSTRINGE. *v. a.* (*perstringo*, Lat.) To graze upon; to glance upon.

PERSUADABLE. *a.* (from *persuade*.) Such as may be persuaded.

To PERSUADE. *v. a.* (*persuadeo*, Latin.) 1. To bring to any particular opinion (*Wake*). 2. To influence by argument or expostulation. *Persuasion* seems rather applicable to the passions, and *argument* to the reason; but this is not always observed (*Sidney*). 3. To inculcate by argument or expostulation (*Taylor*). 4. To treat by persuasion: not in use (*Shakspeare*).

PERSUA'DER. *s.* (from *persuade*.) One who influences by persuasion; an importunate adviser (*Bacon*).

PERSUASIBLE. *a.* (*persuasibilis*, Lat.) To be influenced by persuasion (*Gov. of the Tongue*).

PERSUA'SIBLENESS. *s.* (from *persuasible*.) The quality of being flexible by persuasion.

PERSUA'SION. *s.* (*persuasion*, French; from *persuasus*, Latin.) 1. The act of persuading; the act of influencing by expostulation;

the act of gaining or attempting the passions (*Olway*). 2. The state of being persuaded; opinion.

PERSUA'SIVE. *a.* (*persuasif*, French; from *persuade*.) Having the power of persuading; having influence on the passions (*Hooker*).

PERSUA'SIVELY. *ad.* (from *persuasive*.) In such a manner as to persuade (*Milton*).

PERSUA'SIVENESS. *s.* (from *persuasive*.) Influence on the passions (*Hammond*).

PERSUA'SORY. *a.* (*persuasorius*, Latin.) Having the power to persuade (*Brown*).

PERT. *a.* (*pert*, Welsh.) 1. Lively; brisk; smart (*Milton*). 2. Saucy; petulant; with bold and garrulous loquacity (*Collier*).

To PERTAIN. *v. n.* (*pertineo*, Latin.) To belong; to relate (*Peacham*).

PERTEREBRATION. *s.* (*per* and *terebatio*, Lat.) The act of boring through (*Ainsworth*).

PERTH, the capital of Perthshire, with two churches, one of which belonged formerly to a fine abbey. It has been the residence of the sovereigns of Scotland, and the seat of the parliament and of the supreme courts of justice. The tide comes up to this place, and the river is navigable for small vessels. Here is a great linen and cotton manufacture. In 1801 the inhabitants amounted to 14,878. Perth is seated on the Tay, over which is a bridge, 30 miles N. of Edinburgh. Lon. 3. 27 W. Lat. 56. 22 N.

PERTSHIRE, a county of Scotland, bounded on the N. by the shires of Inverness and Aberdeen; on the E. by Angusshire and the frith of Tay; on the S. by the counties of Fife, Kinross, Clackmannan, and Stirling; and on the W. by Argyleshire. It extends 60 miles from E. to W. and nearly the same from N. to S. The northern district, called Athol, is mountainous, and contains some lakes. This county contains about 4,068,640 acres; and in 1801 had 126,366 inhabitants.

PERTH AMBOY, a seaport of the United States, in New Jersey, seated on a neck of land, between the river Raritan and Arthur Kull Sound. It lies open to Sandy Hook, and is one of the best harbours on the continent. It is 25 miles S.W. of New York. Lon. 75. 0 W. Lat. 40. 35 N.

PERTINA'CIOUS. *a.* (from *pertinax*, Lat.) 1. Obstinate; stubborn; perversely resolute (*Walton*). 2. Resolute; constant; steady (*South*).

PERTINA'CIOUSLY. *ad.* Obstinate; stubbornly (*King Charles*).

PERTINA'CITY. PERTINA'CIOUSNESS. *s.* (*pertinacia*, Latin; from *pertinacious*.) 1. Obstnacy; stubbornness (*Brown*). 2. Resolution; constancy.

PERTINACY. *s.* (from *pertinax*, Latin.) 1. Obstnacy; stubbornness; persistency. 2. Resolution; steadiness; constancy (*Taylor*).

PERTINAX (Publius Helvius), a Roman emperor after the death of Commodus. He was descended of an obscure family, and for some time followed the mean employment of making charcoal. Though indigent, he re-

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ceived a liberal education, and he, for some time, taught the Greek and Roman language in Etruria. He left this profession for a military life, and by his valour gradually rose to the highest offices in the army, and was made consul by M. Aurelius, for his eminent services. He was afterwards entrusted with the government of Moesia, and at last he presided over the city of Rome as governor. When Commodus was murdered, Pertinax was universally selected to succeed him. He acquiesced with reluctance, but his mildness and economy convinced the senate and the people of the prudence of their choice. After having made many salutary regulations in the state, and gained the affection of the worthiest and most discerning of his subjects, the extravagant and luxurious alone raised clamours against him, and when Pertinax attempted to introduce among the pretorian guards that discipline which was necessary to preserve the tranquillity of Rome, the minds of the soldiers became totally alienated. Pertinax was apprized of this mutiny, but he refused to fly at the hour of danger, and he scorned the advice of his friends who wished him to withdraw from the impending storm. He was assassinated by his soldiers, and his head was cut off and carried upon the point of a spear, as in triumph, to the camp. This happened on the 28th of March, A. D. 193. Pertinax reigned only 87 days, and by his death the Roman empire was robbed of a wise, virtuous, and benevolent emperor.

PERTINENCE. *PERTINENCY.* *s.* (from *pertineo*, Latin.) Justness of relation to the matter in hand; propriety to the purpose; appositiveness (*Bentley*).

PERTINENT. *a.* (*pertinens*, Lat. *pertinent*, Fr.) 1. Related to the matter in hand; just to the purpose; not useless to the end proposed; apposite (*Bacon*). 2. Relating; regarding; concerning (*Hooker*).

PERTINENTLY. *ad.* (from *pertinent*.) Appositely; to the purpose (*Taylor*).

PERTINENTNESS. *s.* Appositiveness.

PERTINGENT. *a.* (*pertingens*, Latin.) Reaching to; touching.

PERTLY. *ad.* (from *pert*.) 1. Briskly; smartly (*Pope*). 2. Saucily; petulantly (*Swift*).

PERTNESS. *s.* (from *pert*.) 1. Brisk folly; sauciness; petulance (*Pope*). 2. Petty liveliness; spiritlessness without force, dignity, or solidity (*Watts*).

PERTRANSIENT. *a.* (*pertransiens*, Lat.) Passing over.

To PERTURB. To PERTURBATE. *v. a.* (*perturbo*, Lat.) 1. To disquiet; to disturb; to deprive of tranquillity (*Sandys*). 2. To disorder; to confuse; to put out of regularity (*Brown*).

PERTURBATION. *s.* (*perturbatio*, Lat.) 1. Disquiet of mind; deprivation of tranquillity (*Ray*). 2. Restlessness of passions (*Bacon*). 3. Disturbance; disorder; confusion; commotion (*Bacon*). 4. Cause of disquiet (*Shakspeare*). 5. Commotion of passions (*Ben Jonson*).

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PERTURBATOIR. *s.* (*perturbator*, Lat.) Raiser of commotions.

PERTUIS, a town of France, in the department of the Mouths of the Rhone, 10 miles N. of Aix and 27 of Marseilles. Lon. 5. 36 E. Lat. 43. 44 N.

PERTUSED. *a.* (*pertusus*, Lat.) Bored; punched; pierced with holes.

PERTUSION. *s.* (from *pertusus*, Latin.)

1. The act of piercing or punching (*Arbuth.*).
2. Hole made by punching or piercing (*Bac.*).

PERTUSSIS. (from *per*, much, and *tussis*, cough.) The whooping cough. A genus of disease in the class neuroses, and order spasmi of Cullen, known by a convulsive strangulating cough, with whooping, relieved by vomiting, and being contagious.

PERU, a large country of S. America, bounded on the N. by Popayan, on the W. by the Pacific Ocean, on the S. by Chili, and on the E. by the Andes. It is 1500 miles from N. to S. and 125 from E. to W. but in some places it is much broader. It never rains in the south parts; but in the north, where the mountains are not so high, it often rains excessively. There are large forests on the sides of the mountains which advance near the sea; but none of the trees are like those in Europe. Peru has been long celebrated for its mines of gold and silver, which are the chief or only source of its riches. Notwithstanding the little industry which is employed in working them, and the small help that commerce affords to the miners, 534,000 marks of silver, and 6,038 of gold, were smelted and refined in the royal mint at Lima, in 1790; and 5,162,239 piastres, in both materials, were coined there. Beside the produce of the mines, the commodities exported are sugar, Vienna wood, cotton, Peruvian bark, copper, and cocoa. The fiercest beasts of prey in Peru are the puma and jaguar, inaccurately called lions and tigers by the Europeans, but possessing neither the undaunted courage of the former, nor the ravenous cruelty of the latter: they are hardly formidable to man, and often turn their backs on the least appearance of resistance. A quadruped called the lama, peculiar to this country, was tamed to domestic purposes by the ancient Peruvians. In form it bears some resemblance to a deer, and some to a camel, and is of a size somewhat larger than a sheep. Its wool furnished the Peruvians with clothing, its flesh with food. It was even employed as a beast of burden, and carried a moderate load with much patience and docility; but it was never used for draught. Among the birds, the most remarkable is the condor, which is entitled to preeminence over the flying tribe, in bulk, strength, and courage. The river Guyaquil abounds with alligators, and the neighbouring country swarms almost as much with snakes and vipers as that round Porto Bello does with toads. When the Spaniards landed in this country, in 1530, they found it governed by sovereigns called Incas, who were revered by their subjects as divinities; and the inhabitants were found to be much more polished than

the natives of other parts of America, those of Mexico excepted. These were soon subdued by a few Spaniards, under the command of Francis Pizarro. Peru is inhabited by the Spaniards, the native Americans, and a mixture arising from both, called Mestics. The native Americans, who live among the forests, form, as it were, so many small republics, which are directed by a Spanish priest, and by their governor, assisted by the original natives, who serve as officers. They have no distrust, for they leave the doors of their huts always open, though they have cotton, calabashes, and a sort of aloes, of which they make thread, and several other small matters that they trade with, which might be easily stolen. They go naked, and paint their bodies with a red drug, called rocu. The same man is of all trades, for he builds his own hut, constructs his own canoe, and weaves his own cloth; but if a large house is to be built for common use, every one lends a helping hand. Their skin is of a red copper colour; and they have no beard nor hair on any part of their bodies except their heads, where it is black, long, and coarse. Those that are not much exposed to the weather are of a lighter colour than the rest. The natives who live at Quito seem to be of a different temper; for they are extremely idle, and so stupid, that they will sit whole days together upon their heels, without stirring or speaking. Their garment is a sort of a sack, with holes to put their arms through; and this is given them by their masters as part of their wages. The Mestics, though illegitimate, have all the privileges of a Spaniard, and are the persons who carry on all trades; for the Spaniards think it beneath them to meddle with any thing of this sort: they behave in a more tyrannical manner over the real Americans, than even the Spaniards themselves, inasmuch that the governor is obliged to repress their insolence. Peru is now divided into three great audiences, which are Quito, Lima or Los Reyes, and Los Charcos; the whole under the government of a viceroy, whose authority once extended over all S. America, possessed by the Spaniards: but as some of the countries in this vast jurisdiction are above 2000 miles distant from the supreme seat of justice at Lima, the inhabitants were subject to the greatest inconveniences; to remedy which, two new viceroyalties have been established. The first is fixed at St. Fé de Bogota, the capital of the new kingdom of Granada, and extends over the whole of Terma Firma, and the audience of Quito. In the jurisdiction of the second, established in 1776, are the provinces of Plata, Buenos Ayres, Paraguay, Tucuman, Potosi, St. Cruz de la Sierra, and the towns of Mendoza and St. Juan. Lima is the capital. See *ANDES*.

PERU (Balsam of). See *MYROXYLON*.

To *PERVADE*. *v. a.* (*pervado*, Lat.) 1. To pass through an aperture; to permeate (*Black*). 2. To pass through the whole extension.

PERVA'SION. *s.* (from *pervade*.) The act of pervading or passing through (*Boyle*).

PERVERSE. *a.* (*pervers*, Fr. *perversus*, Latin.) 1. Distorted from the right (*Milton*). 2. Obstinate in the wrong; stubborn; untractable (*Dryden*). 3. Petulant; vexatious; peevish; desirous to cross and vex; cross (*Shakspeare*).

PERVERSELY. *ad.* With intent to vex; peevishly; vexatiously; spitefully; crossly; with petty malignity (*Decay of Piety*).

PERVERSENESS. *s.* (from *perverse*.) 1. Petulance; peevishness; spiteful crossness (*Donne*). 2. Perversion; corruption: not in use (*Bacon*).

PERVERSION. *s.* (*perversion*, Fr.) The act of perverting; change to worse (*Swift*).

PERVERSITY. *s.* (*perversité*, Fr.) Perverseness; crossness (*Norris*).

To *PERVERT*. *v. a.* (*perverto*, Latin.) 1. To distort from the true end or purpose (*Milton*). 2. To corrupt; to turn from the right (*Milton*).

PERVERTER. *s.* (from *pervert*.) 1. One that changes any thing from good to bad; a corrupter (*South*). 2. One who distorts any thing from the right purpose (*Stillingfleet*).

PERVERTIBLE. *a.* (from *pervert*.) That may be easily perverted (*Ainsworth*).

PERUGIA, an ancient and populous city of Italy, capital of Perugino, with a strong citadel, a university, and a bishop's see. The churches, and many other buildings, public and private, are very handsome. It is seated on a hill, 75 miles N. of Rome. Lon. 12. 20 E. Lat. 43. 6 N.

PERUGIA, a lake of Italy, eight miles from the city of that name, in the province of Perugino. It is almost round, five miles in diameter, and in it are three islands.

PERUGINO, a province of Italy, in the Ecclesiastical State, bounded on the W. by Tuscany, on the S. by Orvietano, on the W. by the duchies of Spoleto and Urbino, and on the N. by the county of Citta Castellana. It is 25 miles in length, and near as much in breadth. The air is pure, and the soil fertile in corn and good wine. The capital is Perugia.

PERVICA'CIOUS. *a.* (*pervicax*, Latin.) Spitefully obstinate; peevishly contumacious (*Clarendon*).

PERVICA'CIOUSLY. *ad.* (from *pervicacious*.) With spiteful obstinacy.

PERVICA'CIOUSNESS, *PERVICA'CITY*. *PERVICA'CY*. *s.* (*pervicacia*, Latin; from *pervicacious*.) Spiteful obstinacy.

PERVIOUS. *a.* (*pervius*, Latin.) 1. Admitting passage; capable of being permeated (*Taylor*). 2. Pervading; permeating: not proper (*Prior*).

PERVIOUSNESS. *s.* (from *pervius*.) Quality of admitting a passage (*Boyle*).

PERUKE. *s.* (*peruque*, French.) A cap of false hair; a periwig (*Wiseman*).

To *PERUKE*. *v. a.* (from the noun.) To dress in adscitious hair.

PERUKEMAKER. *s.* (*peruke* and *maker*.) A maker of perukes; a wigmaker.

PERULA, in botany, a genus of the class dioecia, order polyandria. Calyx two-leaved, corol one-petalled. Male: germs four, barren, on short pedicels. Female: styles one to each germ; capsule pedicelled, drooping, three-celled, three-valved; seeds solitary. One species only. A New Grenada shrub.

PERUSAL. *s.* (from *peruse*.) The act of reading (*Atterbury*).

To **PERUSE**. *v. a.* (*per* and *use*.) 1. To read (*Bacon*). 2. To observe; to examine (*Shakspeare*).

PERUSER. *s.* (from *peruse*.) A reader; examiner (*Woodward*).

PERUVIAN MASTIC TREE. See **SCHINUS**.

PERUVIAN BARK. See **CINCHONA**.

PERUVIANUS CORTEX. Peruvian bark. See **CINCHONA**.

PERUVIANUS CORTEX FLAVUS. See **CINCHONA**.

PERUVIANUS CORTEX RUBER. See **CINCHONA**.

PES ALEXANDRINUS. See **PYRETHRUM**.

PES CATI. See **GNAPHALUM**.

PES COLUMBINUS. See **GERANIUM COLUMBINUM**.

PES LEONIS. The ladies mantle is sometimes so called. See **ALCHEMILLA**.

PESARO, a fortified seaport of Italy, in the duchy of Urbino, and a bishop's see. The cathedral is magnificent, and it has handsome churches, convents, and palaces, with exquisite paintings. The environs are remarkable for producing olives, and excellent figs. It is seated on an eminence, at the mouth of the Foglia, on the gulf of Venice, 17 miles E.N.E. of Urbino. Lon. 13. 2 E. Lat. 43. 52 N.

PESCARA, a strong town of Naples, in Abruzzo Citeriore. It was taken by the French in 1798, and stands at the mouth of a river of the same name, on the gulf of Venice, 10 miles N.N.E. of Civita di Chieti.

PESCHIERA, a strong town of Italy, in the Veronese. It was taken by the French in 1796; and the garrison surrendered to the Austrians in 1799. It is seated on the river Mincio, where it proceeds from the lake Garda, 16 miles W. of Verona.

PESCIA, a town of Tuscany, celebrated for its fine oil, 27 miles W. by N. of Florence.

PESSARY. (from *πῆσσω*, to soften.) An instrument that is introduced into the vagina to support the uterus.

PEST, a town of Hungary, capital of a county of the same name, with a fortress, a royal palace, and a university, the only one in the kingdom. Here are many Greek merchants, who conduct the Levant trade to Germany and the northern nations. It is seated on the E. side of the Danube, opposite Buda, 96 miles E.S.E. of Presburg. Lon. 19. 3 E. Lat. 47. 30 N.

PEST. *s.* (*peste*, Fr. *pestis*, Lat.) 1. Plague; pestilence (*Pope*). 2. Any thing mischievous or destructive (*Milton*).

To **PESTER**. *v. a.* (*pester*, Fr.) 1. To disturb; to perplex; to harass; to turmoil (*Swift*). 2. To encumber (*Milton*).

PESTERER. *s.* (from *pester*.) One that pesters or disturbs.

PESTEROUS. *a.* (from *pester*.) Encumbering; cumbersome (*Bacon*).

PESTHOUSE. *s.* (from *pest* and *house*.) A hospital for persons infected with the plague.

PESTIFEROUS. *a.* (from *pestifer*, Latin.)

1. Destructive; mischievous (*Shakspeare*).

2. Pestilential; malignant; infectious (*Arb*).

PESTILENCE. *s.* (*pestilence*, Fr. *pestilentialia*, Lat.) Plague; pest; contagious distemper (*Shakspeare*).

PESTILENT. *a.* (*pestilent*, Fr. *pestilens*, Latin.) 1. Producing plagues; malignant (*Bentley*).

2. Mischievous; destructive (*Knolles*).

PESTILENTIAL. *a.* (*pestilential*, Fr.)

1. Partaking of the nature of pestilence; producing pestilence; infectious; contagious (*Woodward*).

2. Mischievous; destructive; pernicious (*South*).

PESTILENTLY. *ad.* (from *pestilent*.) Mischievously; destructively.

PESTILLATION. *s.* (*pestillum*, Lat.) The act of breaking in a mortar (*Brown*).

PESTIS. The plague. A genus of disease in the class pyrexia and order exanthemata of Cullen, characterized by typhus, which is contagious in the extreme, prostration of strength, buboes, and carbuncles, petechiæ, hæmorrhage, and colliquative diarrhoea.

PESTLE. *s.* (*pestillum*, Lat.) An instrument with which any thing is broken in a mortar (*Locke*).

PESTLE OF PORK. *s.* A gammon of bacon.

PET. *s.* (perhaps from *petit*, little.) 1. A slight passion; a slight fit of peevishness (*L'Estrange*). 2. A lamb taken into the house and brought up by hand. See **PEAT**. (*Hanmer*).

PETAGUEL, a province on the N. coast of Brasil, between the provinces of Seara and Rio Grande. It contains mines of silver.

PETAL, in botany. (*πέταλον*, from *πέλω*, to expand.) The Greek word signifies a leaf; but it has been appropriated by Columna, and from him by other modern authors, the flower-leaf. Tegmen floris corollaceum, Philos. Bot. The corollaceous integument of the flower. In flowers of one petal, the corol and petal are the same. In flowers of several petals, the corol is the whole, and the petals are the parts. Or, to speak more accurately, in a monopetalous flower, the petal is the corol, exclusive of the nectary: in a polypetalous flower, it is one of the leaves of which the whole corol is composed.

In the former it consists of the tube and limb. In the latter of the claw and lamina.

PETALIFORM STIGMA. In botany, a petal-shaped stigma: as in iris.

PETALINUM NECTARIUM. A petaline nectary.

PETALOMA, in botany, a genus of the

class decandria, order monogynia. Calyx cup-shaped, five-toothed; petals five, inserted into the calyx; stamens seated on the margin of the calyx; berry one-celled. Two species; tall trees of Guiana and the West Indies.

PETALOUS FLOWER, in botany, a petalled flower, or a flower having petals; in opposition to apetalous, destitute of petals, or having no corol.

PETARD, in war, a kind of engine of metal, somewhat in shape of a high-crowned hat, or truncated cone; serving to break down gates, barricades, draw-bridges, or the like works which are intended to be surprised.

The petard may be considered as a piece of ordnance, very short, narrow at the breech, and wide at the muzzle; made of copper mixed with a little brass; or of lead with tin; usually about 8.5 inches within at the bottom; the diameter at the beginning of the round part is six, and distant from the lower base nine inches: the circular part is described from the point where the perpendicular to the sides meets the middle line or axis; the thickness of metal is 1.6 inches: there is a brim at the bottom that projects the metal by two inches, and is one inch thick, in which are six holes of half an inch diameter, which serve for screws to fasten the petard on a board in a firm manner; there is a cavity within at the bottom, half an inch deep, and as much in height to fix a board, in order to keep the charge in the petard before it is fixed to the board or plank. There are likewise two handles of about three inches from the flat ring, five inches long, $\frac{7}{8}$ thick, and 1.8 from the outside to the metal. Lastly, a hole of an inch diameter is made either at the top, or on the side, to screw in an iron fuse by which the powder is fired, which fuse is filled with a slow composition, in order that when it is lighted, the petardier may have time to retire out of danger. See the section of a petard in fig. 9. pl. 133.

PETASITES. (*πετασίτης*; from *πετασος*, a hat, so named because its leaves are shaped like a hat.) Butterbur. Pestilentwort. *Tussilago petasites* of Linnéus. The roots of this plant are recommended as aperient and alexipharmic, and promise, though now forgotten, to be of considerable activity. They have a strong smell, and a bitterish acrid taste, of the aromatic kind, but not agreeable.

PETAVIUS (Dionysius), or **DENIS PETAVU**, a French jesuit, born at Orleans, 1583. He was at the age of 19 made professor of philosophy at Bourges, and was admitted among the jesuits in 1605. He defended the catholic religion against the protestants, and his criticisms were particularly directed against Scaliger, and even against his friend Casaubon. He died after a life spent in the service of literature, 1652. He was, according to Gassendus, the most consummate scholar the jesuits ever had. As a chronologist he was particularly eminent, and his Latin is elegant and refined. He wrote *De doctrinâ temporum*, 2 vols. fol.—*uranologia*, 3 vols.—*Rationarium temporum*, fol. and Leyden, 2 vols. 8vo. a valuable work

abridged by Le Clerc.—*Dogmata theologica*, 5 vols. fol.—the Psalms translated into Greek verse, 12mo.—*De ecclesiâ hierarchiâ*, folio, besides controversial pamphlets.

PE-TCHE-LI, the principal province of China, bounded on the N. by the great wall and part of Tartary, E. by the Yellow sea, S. by Chang-tong and Honan, and W. by the mountains of Chan-si. It contains nine cities of the first class, which have many others under their jurisdiction. Although Pe-tche-li extends no further than the 42d degree N. yet all its rivers are so much frozen during four months in the year, that waggons with the heaviest loads may safely pass them. The soil is sandy, and produces very little rice; but it abounds with all other kind of grain, and with the greater part of the fruit trees common in Europe. But what renders this province the most considerable is, that the riches of the whole empire are brought hither, the southern provinces furnishing it with every thing they produce, that is most uncommon and delicious. The inhabitants, in general, are reckoned not so polite, nor so apt to learn the sciences, as those of the southern provinces; but they are stronger and more warlike, in which they resemble the people who inhabit the northern provinces. Peking is the capital.

PETCHSTEIN, in mineralogy. See **PITCHSTONE**.

PETECHIÆ. (from the Italian *petechio*, a fleabite, because they resemble the bites of fleas.) Red or purple spots that mostly appear in contagious diseases.

PETER (St.), the apostle, born at Bethsaida, was son of John, Jona, or Joanna, and brother of St. Andrew (John i. 42, 43.). His first name was Simon or Simeon; but when our Saviour called him to the apostleship, he changed his name into Cephas, that is, in Syriac, a stone or a rock; in Latin, *petra*, whence Peter. He was a married man; and had his house, his mother-in-law, and his wife, at Capernaum, upon the lake of Gennesareth (Mark i. 29. Mat. viii. 14. Luke iv. 38.). St. Andrew, having been first called by Jesus Christ, met his brother Simon, and told him, (John i. 41.) We have found the Messiah, and then brought him to Jesus. Jesus beholding him, said to him, Thou art Simon, son of Jonah; henceforth thou shalt be called Cephas, that is, stone or rock. After having passed one day with our Saviour, they returned to their ordinary occupation, which was fishing. Yet it is thought they were present with him at the marriage of Cana in Galilee. This happened in the 30th year of the vulgar Christian era.

The acts which distinguish the apostleship of St. Peter are fully detailed in the sacred scriptures; for which reason we forbear to introduce them in this place.

St. Peter was the author of two epistles, received into the canon of the New Testament. Of these the former was written from a city which the apostle called Babylon; whether he meant the remains of the former city of Baby-

ion, or adumbrated Jerusalem under that name, is uncertain: Michaelis inclines to the latter opinion. The date of this first epistle is generally assigned between the years 63 and 65. The second epistle, written soon after the former, and (ch. i. 14.) when the apostle was old and near his end, is usually dated in 65. The apostle suffered martyrdom not long after this epistle was written, that is, at latest, about A. D. 68.

St. Peter's style, says a modern author, expresses the noble vehemence and fervour of his spirit, the full knowledge he had of Christianity, and the strong assurance he had of the truth and certainty of his doctrine; and he writes with the authority of the first man in the college of the apostles. He writes with that quickness and rapidity of style, with that noble neglect of some of the formal consequences and niceties of grammar, still preserving its true reason, and natural analogy (which are always marks of a sublime genius), that you can scarce perceive the pauses of his discourse and distinction of his periods. The great Joseph Scaliger calls St. Peter's first epistle majestic; and we hope he was more judicious than to exclude the second, though he did not name it.

A noble majesty, and becoming freedom, is what distinguishes St. Peter; a devout and judicious person cannot read him without solemn attention and awful concern. The conflagration of this lower world, and future judgment of angels and men, in the third chapter of the second, is described in such strong and terrible terms, such awful circumstances, that in the description we see the planetary heavens and this our earth wrapped up with devouring flames, hear the groans of an expiring world, and the crushes of nature tumbling into universal ruin.

The authority of the second epistle of St. Peter was for some time doubted of, as Origen, Eusebius, St. Jerome, and others, have observed. What made the ancients call it in question, is the difference of its style from the first. The third chapter, which describes the catastrophe of the visible world, made Grotius think this epistle was wrote after the taking of Jerusalem; because that was not to happen till after the destruction of that city; upon which he conjectures, that Simeon, bishop of Jerusalem, is the author of this epistle, and that the inscription which carries St. Peter's name is corrupted. But the best critics admit this epistle to be the genuine work of St. Peter, who discovers himself where he says, that he was present at our Lord's transfiguration; and where he tells the Jews, this was the second letter he had written to them. The reader may see this question fully discussed, and the authority of this epistle established beyond all doubt, by the learned Dr. Sherlock, in his Dissertation on the authority of the Second Epistle of St. Peter.

St. Peter has been made the author of several books, such were his Acts, his Gospel, his Revelation, his work about preaching, and another about judgment. There is extant a

large history of St. Peter, called the Recognitions, ascribed to St. Clement.

PETER ALEXIOWITZ I. surnamed the Great, succeeded to the throne of Muscovy, on the death of his brother Theodore, to the exclusion of his elder brother Iwan, whose intellects were too feeble to support the fatigues of government. This gave offence to Sophia, his half sister, who roused into rebellion the Strelitzes, a formidable body of militia; but Peter, too wise to foment a civil war, consented to share the throne with his brother Iwan. Without education, yet with the strongest powers of nature, Peter felt that much was still to be acquired before he could realize the vast projects of his mind. To counteract the Strelitzes, who were devoted to the intriguing Sophia, and more inclined to dispute than to obey his commands, he became the favourite of the army, and enlisting as a private soldier in a company dressed and disciplined in the German manner, he gradually rose to command by his services, and by sharing the toils and privations of a military life. By the death of his brother in 1696, he became sole emperor, and then conquered Azoph from the Turks. Feeling his inferiority as a naval power, he sent, in 1698, an embassy to Holland, and went in a disguised character in the ambassador's suite; and that he might personally be acquainted with the process of ship-building, he enrolled himself at Amsterdam among the ship carpenters, and worked under the name of master Peter. The next year he passed over to England, where he acquired the complete knowledge of ship-building, and after receiving every mark of respect from William III. he left this country, accompanied by several English ship-builders, and artificers. From England he went to Vienna; but the intelligence that Sophia had roused the Strelitzes to rebellion hastened his return to Moscow. The ringleaders were punished; but the princess, who was the most guilty, was only confined in a monastery. Improved by the view of foreign countries, and the knowledge of their commercial resources, Peter now displayed to the world the enlightened plans of his capacious mind. He liberally invited the most learned among distant nations to seek an honourable residence in Russia, and to instruct his uncivilized subjects in the various arts of life. Russia was therefore visited by sailors, artists, mechanics, mathematicians, and adventurers of every degree and profession; and though his subjects viewed these new settlers with jealousy, Peter soon mingled and united them by the strong ties of mutual dependence and social union. In 1700 he declared war against Charles XII. of Sweden, and though defeated by his enemy, he persevered with undaunted courage, observing, "though I know I must be overcome for a great while, my armies will at last be taught to conquer." In the midst of his disasters in Poland, he formed the project of erecting a new metropolis on the Baltic sea, and after he had added to his dominions the best part of Livonia and Ingria, he,

in 1703, laid the foundations of Petersburg. At last the battle of Pultowa, in 1709, crowned his earnest wishes, and he saw the long victorious Swedes conquered, and their heroic leader Charles obliged to fly. Peter used this victory like a wise man; the Swedish prisoners were induced to settle among their conquerors, and not less than 3000 officers were prevailed upon to fix their residence and spread civilization, improvement, and the arts of polished life, in various parts of his extensive empire. In consequence of the victory of Pultowa, Peter secured the possession of Livonia and Ingria, to which he added part of Pomerania and Finland; but the intrigues of Charles XII. at the Turkish court at last prevailed upon the Ottomans to break the truce, and in 1712 Peter was suddenly surrounded on the banks of the Pruth, and his army devoted to destruction. While he considered every thing as lost, his wife Catherine, offering a large bribe to the grand vizier, saved her husband's honour and his army, and in consequence of this the grateful czar established the order of St. Catherine, into which only women are admitted. After the treaty of peace with Charles XII. Peter visited again foreign countries. In 1716 he was in Denmark, and after visiting the schools, public places, and curiosities, he passed to Hamburg, Hanover, Wolfenbuttle, and Holland, and the next year proceeded to Paris. In the capital of France he was received with great ceremony; but despising the pomp and pageantry of greatness, he preferred the conversation of the learned, and returned home better pleased with the information which he had received, than with the unmeaning marks of homage paid to his imperial rank. When at Paris he visited the tomb of Richelieu, exclaiming, "great minister, would it might have happened you had lived in my age, I would have granted you half of my dominions to learn from you how to govern the rest." Returned to Russia, Peter laboured to reform and improve the character of his country. After breaking gradually to pieces the dangerous establishment of the Strelitzes, he appointed a regular body of 100,000 troops; he built a navy of 40 ships of the line; he established colleges and schools of medicine, botany, belles lettres, &c. in the chief cities of his dominions, and by purchasing pictures of celebrity from Italy, he introduced a taste for painting and the fine arts among his subjects; and made the largest possible collections of books and manuscripts in various languages, wisely distributed where they could prove most useful. Religion, pure and uncorrupt, was made, as far as his zealous endeavours could, to supersede superstition and ignorance; the patriarchate, once formidable even to the sovereign, was abolished, and the people were instructed in their own, and not in a foreign language. The laws were rendered more simple, decisions were to be announced before the expiration of 11 days; and in short every measure which could tend to meliorate the situation of the people, to increase their knowledge, and to

contribute to their comfort, was, with the most liberal policy, adopted and enforced. This truly great and worthy prince died of a strangury, caused by an imposthume in the neck of his bladder, 28th Jan. 1725, in his 53d year. Peter had a son, Alexis, who lived to the age of manhood; but engaged in a conspiracy in 1717, against his father, and was condemned to die; and though the sentence was suspended, he died some short time after, not without suspicion of being cut off privately by the czar, as several of his accomplices suffered the severest punishment of the law. At his death, Peter appointed for his successor his widow Catherine, whom, from a soldier's wife, he had raised, in consequence of her heroic character, to share his bed and his throne. Peter wrote several pieces on naval affairs. (*Lempriere.*)

PETER II. emperor of Russia, son of Alexis Petrowitz, succeeded the empress Catherine, at the age of 13, in 1727. The prominent feature of his reign is the banishment into Siberia of the great favourite Menzikoff. The emperor died of the small-pox, 1730, aged 15.

PETER III. emperor of Russia, son of Anne, the eldest daughter of Peter the Great, was born 1728, and ascended the throne after the empress Elizabeth, 1761. The beginning of his reign was auspicious; he admired the character of the heroic king of Prussia, but unfortunately wanted the vigour and decision which marked that great man. His attempts therefore to reform his people proved abortive, and rendered him contemptible; so that his wife Catherine, taking advantage of his timidity, dethroned him, 6th July, 1762, and assumed the reins of government under the name of Catherine II. Peter died seven days after; but though his death is attributed to an hemorrhoidal flux, it is too evident that violence terminated his existence.

PETER, of Cluni, or the Venerable, was born in Auvergne, and was made, in 1121, general of the order of Cluni. He received at his abbey pope Innocent II. in 1130, and afterwards granted a kind asylum to the unfortunate Abelard. He died 1156, aged 65. He wrote treatises on the divinity of Christ—against the Jews—on infant baptism—the authority of the church, &c.

PETER, an ecclesiastic of Blois, preceptor and secretary to William II. king of Sicily. He was invited by Henry II. to England, where he obtained the archdeaconry of Bath, and afterwards that of London. He died in England, 1200. Of his writings, 183 letters, 65 sermons, &c. have been preserved.

PETER, the Hermit, a gentleman of Amiens, who quitted the military profession to become a pilgrim. Under the expectation of the immediate dissolution of the world, he, with many other deluded men, hastened to the Holy Land, in 1093, that he might terminate his days in a spot where the Saviour was born. On his return, he spoke in so affecting a manner of the cruel treatment which the Christ-

ians experienced in Palestine, that Urban II. sent him over Europe to preach a general crusade to deliver the Holy Land from the infidels. The eloquence of Peter, and the spirit of the times, prevailed; a numerous concourse of people flocked together, and the holy hermit began his march at the head of above 40,000 men. In crossing Hungary, this religious army committed the most horrid excesses, and so provoked the inhabitants, that in skirmishes with them and with the Turks, many lost their lives, and only 3000 reached the gates of Constantinople. In advancing through Asia, the siege of Antioch delayed their progress, and Peter would have abandoned the enterprise, had he not been bound by an oath by Tancred to share the dangers of the crusade. At the conquest of the Holy Land, and in the siege of Jerusalem, 1099, Peter behaved with valour, and for his services was appointed vicar-general of Palestine. He afterwards returned to Europe, and died at the abbey of New-Montier, which he had founded. (*Lempriere.*)

PETER the wild boy, a youth found in a savage state in the woods in Hanover, 1726, where he had lived for some time on berries and roots. He was about 12 years old, but it is unknown how long he had been in that wild state; though from the remains of a shirt collar found about his neck, it is probable he had not been many years exposed. He came to England in 1727, and was placed at a farmhouse at Northchurch, Hants; but no instruction could ever make him articulate words; and he died in 1735, a melancholy instance of savage idiotism. The English government allowed a pension of 35*l.* a year for his support.

PETER AND PAUL (St.), or PETROPAULSKOI, a seaport of Russia, in Kamschatka. The town consists of some log-houses, and a few conical huts. Captain Clarke, who succeeded captain Cook, and died at sea, was interred here. It is seated on the E. side of Awatska bay. Lon. 158. 48 E. Lat. 53. 1 N.

PETER-PENCE was an annual tribute of one penny, paid at Rome out of every family, at the feast of St. Peter. And this Ina, the Saxon king, when he went in pilgrimage to Rome, about the year 740, gave to the pope partly as alms, and partly in recompense of a house erected in Rome for English pilgrims. And this continued to be paid generally until the time of king Henry VIII. when it was enacted, that from henceforth no person shall pay any pensions, Peter-pence, or other impositions, to the use of the bishop or see of Rome.

PETERBOROUGH, a city of Northamptonshire, 81 miles from London. It is the least city except perhaps Ely, and unquestionably the poorest bishopric, though one of the oldest towns in England. It had a monastery dedicated to St. Peter, and founded as early as the year 655, to which the abbot of Croyland and his monks flying for protection in the year 970, they were overtaken and murdered in a

court of this monastery, called the monks church-yard, because they were all buried here; and to this day is to be seen the tombstone, with their effigies, which had been erected over their common grave. Soon after this the Danes destroyed both the monastery and friars, so that it lay destitute for above 100 years. The monks were, however, restored, and lived very sumptuously, with a mitred abbot at their head, till the Reformation, when Henry VIII. converted it into a bishop's see. The cathedral, which is said to be more than 1000 years old, though apparently more modern, is a most noble Gothic fabric, and was much more so before it was defaced in the civil wars. The west front, which is 156 feet broad, is very stately, and, besides columns curiously adorned, is supported by three of the tallest arches in Britain. The windows of the cloisters are finely stained with scripture history and the succession of it abbots. There are in the church, monuments of queen Catherine, wife of Henry VIII. and of Mary queen of Scots; and the figure of one Scarlet, or Scailett, the sexton, who buried them, and lived to 95, after he had buried all the housekeepers of the town twice over. There is but one parish church besides the cathedral. The city is governed like a borough, by a charter of Henry VIII. though without either mayor or aldermen; and sends two members to parliament, every pot-walloper in the town having the liberty of voting. All the officers of the city are elected by the dean and chapter, consisting of six prebendaries, who are all lords of the manor. Besides the dean and chapter, who are an ecclesiastical corporation distinct from the bishop, there are eight petty canons, four students in divinity, one epistler, one gospeller, a subdean, subtreasurer, and chanter, eight choristers, eight singing men, two chancellors, besides a steward, organist, &c. a grammar school, and two charity-schools. The river Nen, over which there is here a wooden bridge, is navigable by barges to Northampton, 50 miles further, which bring coal, corn, &c. and by which they export, in some years, 6000 quarters of malt, besides other goods, especially the woollen manufactures either of cloth or stockings, in which the poor are employed. The air of Peterborough is said not to be very wholesome, by reason of the neighbouring fens; but the water of the river is fresh and good, the highest spring-tide scarcely ever coming up within five miles of the town; and there is plenty of excellent water in their wells. The streets are some of them very narrow, though they have been recently much improved by new paving, under an act of parliament. There is a handsome market-house, over which are kept the assizes and sessions. Its jurisdiction extends over 32 towns and hamlets, wherein the civil magistrates appointed by the royal commission are vested with the same power as judges of assize, and hold their quarterly sessions in this city. Lon. 0. 4 W. Lat. 52. 30 N.

PETERHEAD, a seaport of Scotland, in
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Aberdeenshire, situate on a peninsula, about a mile S. of the mouth of the Ugie. It has two harbours, defended by piers; a considerable trade in the fishery, and to the Baltic; and manufactures of thread, woollen cloth, and cotton. Here is a small fort and a battery. A mineral spring, of a powerful diuretic quality, and the sea-bathing, bring a great resort of company, for whose accommodation there is a ball-room, and many elegant houses. It stands a little to the W. of Buchanness, the most eastern promontory of Scotland, 34 miles N.E. of Aberdeen. Lon. 1. 35 W. Lat. 57. 27 N.

PETERSBURG, a town of Pennsylvania, in York county, 25 miles S.W. of York, and 58 N. of Washington.

PETERSBURG, a town of Virginia, in Dinwiddie county. It has a considerable trade, particularly in tobacco and flour, and is seated on the S. side of the Appamatox, 25 miles S. of Richmond.

PETERSBURG, a town of the state of Georgia, in Albert county, situate at the confluence of Broad with Savannah river, 40 miles N.W. of Augusta.

PETERSBURG, or **ST. PETERBURG**, the metropolis of the empire of Russia, in a government of the same name, with a university. It is seated on the Neva, near the gulf of Finland, and built partly on some islands formed by the river, and partly upon the continent. The ground on which Petersburg now stands was a vast morass, occupied by a few fishermen's huts. Peter the Great first began this city by the erection of a citadel with six bastions, in 1703; he built also a small hut for himself, and some wooden hovels. In 1710, count Golovkin built the first house of brick; and the next year the emperor, with his own hands, laid the foundation of a house of the same materials. From these small beginnings rose the imperial city of Petersburg; and in less than nine years after the wooden hovels were erected, the seat of empire was transferred to it from Moscow. The streets are straight, and generally broad and long, frequently intersecting each other in abrupt and sharp corners; and three of the principal ones, which meet in a point at the admiralty, are above two miles in length: most of them are paved, but a few still remain floored with planks; and numerous canals, from one part of the river to another, pass through many of them, by which the inhabitants are supplied with water. In several parts, wooden houses, scarcely superior to common cottages, are blended with the public buildings; but as they are not suffered to be repaired, or if burnt down, to be rebuilt, the number of them is now reduced one half; however, the mother of all that exists in the city, the first wooden cottage of Peter the Great, has a brick building on arches erected over it, to preserve it as a sacred relic of that monarch. The brick houses are covered with stucco, painted of a pink, yellow, or green colour; the roofs of them are nearly flat, formed of sheet or cast iron, or sheet copper, and com-

monly painted green or red: tiles are only used for outhouses and the meaner sort of buildings. The mansions of the nobility are vast piles of building, furnished in the most elegant style. Petersburg, though more compact than the other Russian cities, bears a resemblance to the towns of this country, and is built in a very straggling manner. On the S. and S.E. it has a boundary formed by the town ditch, which is dug far beyond the built parts; and on the N.E. and N. flows the most northern branch of the Neva, called the Nevka, which includes a still more ample interstice. The circumference by these and the sea is nearly 20 miles; but the part properly built upon occupies little more than one-fourth of this space. The inhabitants are computed to be 230,000. The main stream of the Neva is, in many places, as broad as the Thames at London, and its banks are lined on each side with a continued range of handsome buildings. On the N. side are the grand ducal palace, the fortress, the custom-house, the academy of sciences, and the academy of arts. On the S. side are the imperial palace, the marble palace, the admiralty, the arsenal, the bank, the mansions of many Russian nobles, and the English-line, so called, because the whole row is almost wholly occupied by English merchants. In the front of these buildings is the quay, which extends three miles, except where it is interrupted by the admiralty; and the Neva, during the whole of that space, is embanked by a wall, parapet, and pavement of hewn granite. The opposite divisions of Petersburg, situate on each side of the Neva, are connected by two bridges, on pontoons; and there are several others over the different arms of the river. These bridges, on account of the large masses of ice driven down the stream from the lake Ladoga, are usually removed when they first make their appearance; and for a few days, till the river is frozen hard enough to bear carriages, there is no communication between the opposite parts of the town. Among the noblest ornaments of Petersburg, is an equestrian statue of Peter the Great, in bronze, of a colossal size; the pedestal of which is a huge rock, brought to the spot at a great expence. Within the walls of the fortress is the cathedral of St. Peter and St. Paul, in which are deposited the remains of Peter the Great, and of the successive sovereigns, except Peter II. buried at Moscow. Petersburg has a considerable trade in exporting the products of the empire, and has a communication by canals and rivers with many of the southern provinces as far as Astrachan, on the borders of the Caspian sea. It is 425 miles N.W. of Moscow, 500 E. by N. of Stockholm, and 1000 N.N.E. of Vienna. Lon. 30. 19 E. Lat. 59. 56 N.

PETERSFIELD, is a handsome town of Hampshire, in England, and sends two members to parliament. It is seated in lon. 1. 5 W. Lat. 51. 5 N.

PETERWARADIN, a fortified town in Slavonia, and one of the strongest frontier places the house of Austria has against the

Turks, seated on the Danube, between the Drave and the Save. Lon. 20. 0 E. Lat. 45. 20 N.

PETER WORT, in botany. See ASCYRUM.

PETESIA, in botany, a genus of the class tetrandria, order monogynia. Corol one-petalled, funnel-form; stigma bifid; berry many-seeded. Shrubs of West Indies and Polynesia.

PETHERTON, a town in Somersetshire, with a market on Tuesday; seated on the Parret, 18 miles S. by W. of Wells, and 133 W. by S. of London. Lon. 2. 41 E. Lat. 50. 56 N.

PETILIA, a town of Magna Græcia, the capital of Lucania, built by Philoctetes, who after his return from the Trojan war left his country Melibœa, because his subjects had revolted.

PETILII, two tribunes who accused Scipio Africanus of extortion. He was acquitted.

PETILIUS. The most remarkable of this name is a governor of the capitol, who stole the treasures intrusted to his care. He was accused, but though guilty, he was acquitted, as being the friend of Augustus.

PETIOLAR CIRRUS. A petiolar tendril. Proceeding from the petiole of a leaf. A petiolar peduncle. Inserted into a petiole. A petiolar bud. Formed from a petiole. A petiolar gland. Growing on the petiole: as in ricinus, iatropa, passiflora, cassia, mimosa, &c.

PETIOLATE LEAF. A petioled leaf. Growing on a petiole or footstalk, inserted into it usually at the base. Opposed to sessile.

PETIOLE. In botany, a leaf-stalk or footstalk. Trunci species, adnectens folium, nec fructificationem. Philos. Bot. Fulcrum sustinens folium. Delin. Pl. Ramus foliiferus, folio proprius. Regn. Veg. A partial stem, supporting the leaf, or connecting it with the stem or branch. It sometimes happens, but very rarely, that the same foot-stalk supports both leaf and fructification, as in turnera and hibiscus.

PETIOLULE. A partial petiole. Connecting a leaflet with the main petiole, in compound leaves.

PETIT (Peter), a considerable mathematician and philosopher of France, was born at Montluçon, in the diocese of Bourges, in the year 1589, according to some, but in 1600 according to others. He first cultivated the mathematics and philosophy in the place of his nativity; but in 1633 he repaired to Paris, to which place his reputation had procured him an invitation. Here he became highly celebrated for his ingenious writings, and for his connections with Pascal, Des Cartes, Mersenne, and the other great men of that time. He was employed on several occasions by cardinal Richelieu; he was commissioned by this minister to visit the seaports, with the title of the king's engineer; and was also sent into Italy upon the king's business. He was at Tours in 1640, where he married; and was

afterwards made intendant of the fortifications. Baillet, in his Life of Des Cartes, says that Petit had a great genius for mathematics; that he excelled particularly in astronomy; and had a singular passion for experimental philosophy. He was intimately connected with Pascal, with whom he made, at Rouen, the same experiments concerning the vacuum, which Torricelli had before made in Italy; and was assured of their truth by frequent repetitions. He died August the 20th, 1667, at Lagny, near Paris, whither he had retired for some time before his decease. He published several works upon physical and astronomical subjects, as well as on chronology and theology.

PETIT, or PETITE, a French word signifying little or small.

PETITE GUERRE denotes the operations of detached parties and the war of posts. See WAR.

PETIT SERGEANTY. See SERGEANTY.

PETIT TREASON. See TREASON.

PETIT GUAVE, a seaport of St. Domingo, seated on a bay at the west end of the island. It is 200 miles E. of Jamaica. Lon. 72. 52 W. Lat. 18. 27 N.

PETITIA, in botany, a genus of the class tetrandria, order monogynia. Calyx four-toothed, inferior; corol four-parted; drupe with a two-celled nut. One species, a shrub of St. Domingo, with flowers in axillary panicles.

PETITIO PRINCIPII, in logic, the taking a thing for true, and drawing conclusions from it as such, when it is really false; or at least wants to be proved before any inferences can be drawn from it.

PETITION, a supplication made by an inferior to a superior, and especially to one having jurisdiction. It is used for that remedy which the subject hath to help a wrong done by the king, who hath a prerogative not to be sued by writ: in which sense it is either general, that the king do him right; whereupon follows a general indorsement upon the same. Let right be done the party: or it is special, when the conclusion and indorsement are special, for this or that to be done, &c.

By statute, the soliciting, labouring, or procuring the putting the hands or consent of above twenty persons to any petition to the king, or either house of parliament, for alterations in church or state, unless by assent of three or more justices of the peace of the county, or a majority of the grand jury at the assizes or sessions, &c. and repairing to the king or parliament to deliver such petition with above the number of ten persons, is subject to a fine of 100l. and three months imprisonment, being proved by two witnesses within six months, in the court of B. R. or at the assizes, &c. And if what is required by this statute be observed, care must be taken that petitions to the king contain nothing which may be interpreted to reflect on the administration; for if they do, it may come under the denomination of a libel: and it is remarkable, that the petition of the city of London for the

sitting of a parliament was deemed libellous, because it suggested that the king's dissolving a late parliament was an obstruction of justice; also the petition of the seven bishops sent to the Tower by James II. was called a libel, &c. To subscribe a petition to the king, to frighten him into a change of his measures, intimating, that if it be denied, many thousands of his subjects will be discontented, &c. is included among the contempts against the king's person and government, tending to weaken the same, and is punishable by fine and imprisonment.

PETITION. *s.* (*petitio*, Lat.) 1. Request; intreaty; supplication (*Shakspeare*). 2. Single branch or article of a prayer (*Dryden*).

To PETITION. *v. a.* (from the noun.) To solicit; to supplicate (*Addison*).

PETITIONARILY. *ad.* (from *petitionary*.) By way of begging the question (*Brown*).

PETITIONARY. *a.* (from *petition*.) 1. Supplicatory; coming with petitions (*Shaks.*). 2. Containing petitions or requests (*Hooker*).

PETITIONER. *s.* (from *petition*.) One who offers a petition (*South*).

PETITORY. *a.* (*petitorius*, Lat. *petitoire*, Fr.) Petitioning; claiming the property of any thing (*Ainsworth*).

PETITOT (John), a curious painter in enamel, born at Geneva, in 1607. He associated his labours with Bordier, his brother-in-law, jointly with whom he painted the portraits of Charles I. and the whole royal family. He died in 1691.

PETIVER (James), a skilful English botanist, contemporary with Plukenet, was apothecary to the charter-house, and died in 1718. Sir Hans Sloane purchased his collection of plants after his death, and with many other learned men attended his funeral, out of respect for his talents.

PETIVERIA. Guinea hen-weed. In botany, a genus of the class heptandria, order monogynia. Calyx four-leaved; corolless; style lateral; stigma pencil-form; seed one with four reflected awns at top. Two species; herbs of Jamaica.

PETOLA, in botany. See **MOMORDICA**.

PETOUNE, a city of Eastern Chinese Tartary, in the department of Kirin. It has scarcely any inhabitants but Tartar soldiers, and Chinese condemned to exile. It is seated on the Songari, 112 miles N. by E. of Kirin, and 500 N.E. of Pekin. Lon. 124. 55 E. Lat. 45. 3 N.

PETRA, the capital town of Arabia Petræa. *Strab.*—This name was common also to four towns in Europe.

PETRÆA, one of the Oceanides.—A part of Arabia, which has Syria at the E. Egypt on the W. Palestine on the N. and Arabia Felix at the S. This part of Arabia is rocky, whence it has received its name. It is for the most part also covered with barren sands.

PETRAPIUM. (*petrapium*, from *petra*, a rock, and *apium*, parsley, so called because it

grows in stony places. **PETROSELINUM** which see.

PETRARCH (Francis), a celebrated Italian of the 14th century, born at Arezzo, in 1304. His genius led him equally to poetry, eloquence, history, and moral philosophy, and the poems which he wrote on his Laura immortalized his name. His father was a Florentine, involved in the political factions of the Bianchi, and wished his son to study the law in aid of his views: but Petrarch was not fond of a court life, and preferred retirement; he therefore fixed his residence at Vaucluse, five miles from Avignon, where he devoted himself to literary pursuits. This spot became endeared to him from his love for the beautiful Laura de Noves, whom he first saw and passionately admired in 1627; but though the feelings of his heart were conveyed in the rapturous language of elegant poetry, he could, it is said, make no impression on the unkind fair. To divert his affections, he travelled, and after visiting Paris, Flanders, Germany, and Rome, he was persuaded to enter into the service of John XXII. The love of Vaucluse and of Laura, however, prevailed over the temptations of greatness; and Petrarch, once more restored to his favourite seat, again devoted his hours to studious pursuits, and to the praises of his beloved mistress. The sweetness of his poetry, and the graces of his muse, spread his celebrity beyond the confines of Avignon, and at the same moment he was solicited by the senate of Rome, by the university of Paris, and by the king of Naples, to come and receive the poetical crown. The offers of Rome, once the mistress of the world, and the cradle of poets, historians, and orators, were too flattering to be withstood, and the modest bard appeared in the capitol, where the poetic crown was fixed on his head with the most solemn ceremony on Easter-day, 1341, and he was declared a citizen of Rome. In 1343 he was drawn from his favourite Vaucluse by Clement VI. who sent him to compliment Joan on her accession to the Neapolitan crown. While at Verona, he was informed of the death of Laura, a melancholy event which deeply affected him, and which he immortalized by all the powers of poetry. In 1352 he bid adieu for ever to Vaucluse, which the death of Laura had converted from a scene of pleasure to melancholy reflection; and entering the service of the Visconti, he engaged in negotiations. Though informed that his patrimony was restored by the Florentines, he preferred to these new honours the peaceful retreat of Arquà, near Padua, given him by his friend de Carrara, and there he died July 1374, aged 70. Petrarch was an ecclesiastic, though he never took priest's orders. He was in private life a very amiable character, and was guided by moderation, though flattered by the great, and honoured by the powerful. His passion for Laura was of the purest kind; though some have ventured to assert, that it was not unmixed with the most licentious concessions. Petrarch as a poet is deservedly

celebrated as one of the restorers of classical learning, and he displayed all the powers of genius and poetical inspiration, not only in his own native language, but in Latin. His sonnets are esteemed as the sweetest, the most elegant, and most highly finished verses ever written in Italian, and his songs possess equal beauty and grace. His Latin poems are not entitled to similar praise. His *Africa*, or the Punic war, is censured as faulty and unclassical. His other works are *de remediis utriusque fortunæ*, &c. translated into French—*de otio religiosorum*—*de verâ sapientiâ*—*de vitâ solitariâ*—*de contemptu mundi*—*rerum memorabilium libri sex*—*de republicâ optime administrandâ*, &c. (*Lemprière*).

PETRE, or SALT PETRE. See NITRE.

PETREA, in botany, a genus of the class didynamia, order angiospermia. Calyx five-parted, very large, coloured; corol wheel-shaped; capsule two-celled, in the bottom of the calyx; seeds solitary. One species, a climbing shrub of America, with blue racemed flowers.

PETREL, in ornithology. See PROCEL-LARIA.

PETRE/SCENT. *a.* (*petrescens*, Latin.) Growing stone; becoming stone (*Boyle*).

PETRIFICATION. *s.* (from *petrify*, Lat.) 1. The act of turning to stone; the state of being turned to stone (*Brown*). 2. That which is made stone.

PETRIFICATION, in natural history, the conversion of vegetable or animal materials into a stony substance. In this conversion these materials are more or less altered from their original state, according to the different fossils they have lain buried among: some of them suffering but little change, and others being highly impregnated with crystalline, spongy, pyritic, or other extraneous matter.

The present subject, as to the substances actually traced in a petrified state, belongs to that branch of science which has of late been denominated ORYCTOLOGY, and will be found treated of under that article. We shall here only briefly advert to the process by which it is probable the extraordinary effect of petrification in vegetable and animal materials is produced.

It is necessary, however, to premise, that petrification has by some mineralogists been understood in a much larger sense than that in which it is understood generally, and in which we mean to employ it ourselves; as importing the formation of stony substances of all kinds; and in this general view it has been divided into two parts; *lapidification* and *substitution*: the former relating to such stony materials as are native or primary minerals, as rocks and fragments of rocks, produced by the processes of aggregation, or cementation; and the latter relating to such as are secondary or adventitious, and produced by a conversion of some part of the vegetable or animal kingdoms into a stony form. It is to the last of these two divisions that the present article relates.

Among plants it is obvious that it can only

be the harder or woody part that can alone be converted into a petrified state, since the more juicy parts are very rapidly decomposed by the process of putrefaction.

Even wood itself, in ordinary circumstances, whether upon the surface of the earth or buried under it, is gradually, by the concurrent action of air and water, decomposed; its texture is broken down, the connexion between the several vegetable principles of which it consists is dissolved, its ingredients enter into new combinations, and no vestige remains, either of its organization or chemical properties. Sometimes, however, it happens that the external figure and internal arrangement are preserved, while the chemical properties have undergone a very obvious alteration, in consequence of which the natural decay is prodigiously retarded; and in various instances even wholly suspended: and it is under this last change that wood is said to be petrified or mineralized.

There are three substances by which this change is brought about, namely, pyrites, oxyd of iron, and siliceous earth, in the form of agate, or hornstone: each of which forms a distinct species of petrified wood.

Pyritous fossil wood occurs principally in the independent coal formation; it is composed entirely of common pyrite, often in a state of semi-decomposition; it appears to contain no ligneous particles, but retains with considerable exactness the external figure, and, in some degree, the internal organization, of wood. The reason why this species presents a less striking resemblance to wood than the others do, is probably the strong crystalline polarity which pyrite possesses. In splitting longitudinally a piece of pyritical wood, it not unfrequently happens that the fibres representing the concentric layers of wood are composed of minute cubes laterally aggregated to each other.

Ferruginous fossil wood is found in hematite, and especially in argillaceous iron ore. Externally it presents the appearance of trunks and branches, and its internal texture has a close resemblance to that of wood. In its chemical composition it does not appear to differ materially from common argillaceous iron ore.

Agatized wood, however, is that which has been chiefly examined, and which presents us with by far the most beautiful specimens of this kind of fossils. It has been made a distinct mineral species by Werner, who has given it the name of holstein or woodstone, of which the following are the characters.

Its colour is ash-grey, passing into greyish-black, yellowish, brownish, and blood-red; the colours run into each other, forming clouds and stripes in a longitudinal direction. It occurs in the shape of trunks, branches, and roots, and presents in the utmost perfection the internal organization of wood, not only the longitudinal fibres and concentric layers being visible, but even the knots and medullary processes. Its internal lustre is various, being

between glistening and dull. Its cross fracture is imperfectly conchoidal, its longitudinal fracture is splintery and fibrous. It is moderately translucent; is harder than glass, and gives fire with steel, but is easily frangible.

It occurs in sand and sand-stone, especially in the hill St. Symphorien near Etampes in France, in Saxony, Bohemia, and Hungary; near Loch Neagh in Ireland, in the beds of sand-stone that lie above the fuller's earth near Woburn in Bedfordshire, and also in the sandy deserts to the west of Egypt. See Nat. Hist. Pl. CVIII. CXII. and CXV.

It not unfrequently happens, that agatized wood before the petrifying process has begun, has been corroded by worms; in which case not only the perforations are filled with siliceous matter, but even the substance of the worm itself has been completely agatized.

Agatized wood discovers slight traces of its origin by affording a few drops of a watery empyreumatic liquor by distillation. It consists however, for the most part, of silex. The origin of petrified wood is generally attributed to the gradual infiltration of the petrifying material; but to this theory, simple, and ingenious, and plausible as it is, there are many objections that yet require to be removed. See the articles CHALCEDONIUS and OPALUS.

Petrified animal substances are produced in the same manner as petrified vegetable substances; and for the reason that we seldom meet with any of the softer parts of plants in a petrified form, we seldom also meet with any of the softer parts of animals; all these equally dissolving in so short a period as to give no opportunity, or nearly so, to the petrifying material, whether of pyritous or siliceous water or other fluid, to infiltrate itself into their vessels, and become substituted for their proper juices before the whole is completely destroyed and wasted away. Hence it is chiefly the bones of quadrupeds, birds, and other animals of the higher classes, and the crusts and shells of insects and worms, that are discovered in this state: upon which we have already written at some length in the article ORYCTOLOGY, and now refer the reader to it.

PETRIFA'CTIVE. *a.* (from *petrifacio*, Lat.) Having the power to form stone (*Bro.*).

PETRIFICATION. *s.* (*petrification*, Fr.; from *petrify*.) A body formed by changing other matter to stone (*Boyle*).

PETRIFIC. *a.* (*petrificus*, Latin.) Having the power to change to stone (*Milton*).

To PETRIFY. *v. a.* (*petrifier*, Fr.; *petra* and *fit*, Latin.) 1. To change to stone (*Woodward*). 2. To make callous, or obdurate.

To PETRIFY. *v. n.* To become stone (*Dryden*).

PETRIKOW, a town of Great Poland, in the palatinate of Siradia, 80 miles S.W. of Warsaw. Lon. 19. 46 E. Lat. 51. 12 N.

PETRILITE, in mineralogy, a species of felspar. See FELDSPATUM.

PETRINA, or PETRINIA, a strong town of Austrian Croatia, seated on the Petrina; 27

miles E. of Carlstadt. Lon. 16. 0 E. Lat. 46. 0 N.

PETROBRUSSIANS, a religious sect, which had its rise in France and the Netherlands about the year 1110. The name is derived from Peter Bruys, a Provencal, who made an attempt, in most respects laudable, to reform the abuses and remove the superstition that disgraced the beautiful simplicity of the gospel. His followers were numerous; and for 20 years his labour in the ministry was exemplary and unremitted. He was, however, burnt in the year 1130 by an enraged populace set on by the clergy.

The chief of Bruys's followers was a monk named Henry; from whom the Petrobrussians were also called Henricians. Peter the Venerable, abbot of Clugny, has an express treatise against the Petrobrussians; in the preface to which, he reduces their opinions to five heads. 1. They denied that children before the age of reason can be justified by baptism, in regard it is our own faith that saves by baptism. 2. They held that no churches should be built, but that those that already are should be pulled down; an inn being as proper for prayers as a temple, and a stable as an altar. 3. That the cross ought to be pulled down and burnt, because we ought to abhor the instruments of our Saviour's passion. 4. That the real body and blood of Christ are not exhibited in the eucharist, but merely represented by their figures and symbols. 5. That sacrifices, alms, prayers, &c. do not avail the dead.

PETROCARYA, in botany, a genus of the class heptandria, order monogynia. Calyx five-cleft; corol five-petalled; stamens fourteen, of which seven are barren; drupe fleshy, fibrous; nut two-celled with a single seed in each cell. Two species, trees of Guiana.

PETROLEUM, in mineralogy, a species of BITUMEN, which see.

PETRONEL. *s.* (*petrinal*, French.) A pistol; a small gun used by a horseman (*Hudibras*).

PETROMYZON. Lamprey. In zoology, a genus of the class pisces, order chondroptergia. Head slenderer than the body; mouth longer above than beneath; teeth orange, hollow within, and surrounded with a fleshy margin, above a little curved, beneath broad; spiracles seven on each side of the neck; on the nape a fistulous opening; without pectoral and ventral fin. These adhere firmly to rocks and other bodies by the mouth, the edges of which are jagged; the body is eel-shaped, slippery and mucous: they live a long time out of the water, and feed on worms, insects, less fishes, and dead bodies; belly long, narrow; vent near the pinnate tail; dorsal fins two; round the eyes numerous perforations; tongue semilunar, hard; teeth serrate. Four species.

1. *M. marinus*. True lamprey. Sea-lamprey. Mouth papillous within; second dorsal fin distinct from the tail. The name petromyzon, or lampetra, as it is sometimes called, is descriptive of its faculty of sucking

PETROMYZON.

or adhering to stones and other substances, which it does with such tenacity as not to be drawn off without difficulty. A lamprey of three pounds weight has been known to raise a stone of twelve pounds, when seized hold of by the hand. This amazing power of suction must arise from the animal's exhausting the air within its body by the hole over the nose; while the mouth is closely fixed to the object, and permits no air to enter. The weight which the lamprey is by this means able to sustain will be equal to that of a column of air of the same circumference with the animal's mouth.

The lamprey sometimes grows so large, as to weigh four or five pounds; its colour is dusky, irregularly marked with dirty yellow. In the mouth are placed twenty rows of small teeth, disposed in circular orders, and placed far back near the throat, four, five, and six, in each row. The branchiæ are situated within the seven apertures, that are found on each side of the neck. Though in shape this animal resembles an eel, yet it is of a thicker and more clumsy form.

The sea lamprey, we should imagine from its name, was only produced in the salt water; it is traced, however, very frequently at the opening of large rivers, where they join the ocean. At certain seasons it is found in many of the British rivers, and also in the Irish. They are sea fishes; but, like salmon, quit the salt waters, and mount the rivers about the end of winter, and after remaining there for a few months, return again to the ocean.

As our manners are probably still far short of that sensuality and extravagance which distinguished the ancient Romans, we do not hear so many fanciful encomiums on particular fishes, nor such enormous sums paid to procure them. Accordingly, the lamprey known among us has obtained no very extraordinary character. It is differently estimated, according to the season in which it is taken, or the place where it is fed. The best season for them is the months of March, April and May; for they are more firm immediately on their arrival in the rivers from the salt water than afterwards. Towards the summer, and in the hot weather, when they have deposited their spawn, they are observed to be much wasted; and their flesh becomes flabby. Those caught in several of the rivers in Ireland the people will not venture to touch; and throughout the whole of Scotland they are held in detestation: while those taken by the English in the Severn are considered as the most delicate of all fishes whatever.

At a very early period, we find, the lamprey was reckoned a great delicacy by the English: that they are a heavy surfeiting food, the experience of one of our monarchs has fatally testified; for the death of Henry I. was occasioned by eating too plentiful a meal of these fishes. Notwithstanding this accident, they seem to have continued in high esteem long afterwards, for we find Henry IV. granting protection to such ships as brought over lampreys

for the table of his royal consort; and his successor issuing out a warrant to William of Nantes, for supplying him and his army with these fishes, wherever they might happen to march.

In proof of the ancient predilection of the English for this fish, it is a custom, from time immemorial, for the city of Gloucester to present annually his majesty with a lamprey pye, covered with a large raised crust. As the gift is made at Christmas, it is with great difficulty the corporation can procure any fresh lampreys at that early season, though they offer a sum far exceeding their usual price.

The fishes of this genus, from some peculiarity in their conformation, generally swim with their body on a level with the surface of the water; and, it is said, can easily be suffocated, by being immersed in it for any considerable time. From this circumstance, it is probable that they require a frequent supply of air for breathing, and they may fairly be regarded as amphibious.

The female, when ready to spawn, digs a hole in the mud, where she deposits her ova; and in this operation, the power of suction, which we have already described, is of singular advantage; for, should she meet with a stone, though of considerable bulk, she raises and carries it out of the way. After the ova are excluded, and buried in the excavation thus formed, the parent remains in the neighbourhood till the young are quickened into life. She is then seen, with her numerous family playing around her; which, as soon as they have acquired sufficient strength, she gradually conducts to the sea.

2. *P. fluviatilis*. Lesser, or river lamprey. Second dorsal fin angulate.

This species is smaller than the former, seldom exceeding fourteen inches in length, and is also distinguished by transverse lines of a blackish colour. The mouth is of the same round form as in the preceding, and is possessed of the same adhesive power. On the upper part of it is a large bifurcated tooth; on each side there are three rows of very minute ones; and on the lower part there are seven, the exterior of which on each side is the largest; body above blackish, varied at the sides, whitish beneath.

Like all the other fishes of this genus, there is between the eyes a spout-hole or orifice, resembling that of the cetaceous fishes, and probably destined for a similar purpose, that of ejecting water from the throat and lungs. The back fin of the river lamprey is not continued uninterrupted to the tail, but is broken off; and behind it there rises a second, which goes round the tail, terminating at the anus.

This species, as well as the larger kind, is also eaten, potted and highly seasoned: by some it is preferred to the sea lamprey, as being milder tasted. All these fishes are probably heavy and unwholesome; and rather recommended by the epicure than the physician. They are taken in such vast numbers in the Thames, the Severn, and the Dee, that they constitute

a considerable branch of trade. They are sold to the Dutch, who use them for bait in the cod fishery: besides what are consumed in England, 450,000 have been exported in a season for this purpose, at two pounds per thousand. This species is also found in Japan and the lakes of South America

3. *P. brancialis*. Pride. Lampren. Second dorsal fin linear: mouth lobate.

This species is exceedingly small, being only from six to eight inches long. It is a British fish, but found also in the rivers of Germany and Italy. In the river Isis, and other streams near Oxford, they are abundant, where, instead of concealing themselves, they roll in the mud, and never are observed to adhere to the stones, like the other lampreys.

The back is of a livid colour, approaching to black; the belly silvery, and more resplendent than the larger kinds. The mouth is of an elliptical shape; within it are six or seven teeth, and above them a small semicircular bone. Upon the top of the head is a small tube, or aperture, like the cetaceous fishes: the belly swells and contracts alternately, as in those animals which breathe by means of lungs. It has two dorsal fins; the first rising about the middle, and supported by small tendons, that are scarcely visible; the other takes its rise immediately behind it, surrounds the tail, and terminates in the middle space, between the tail and the anus.

4. *P. planeri*. Planer's lamprey. Body annulate; mouth papillous: teeth in a single row, with others close behind them; breast thicker than in the others. Inhabits the fresh water rivers of Thuringia and other parts of Germany.

PETRONIUS. The most celebrated of this name is a great favourite of the emperor Nero, and one of the ministers and associates of all his pleasures and his debauchery. Hewas naturally fond of pleasure, and effeminate, and passed his whole nights in revels and the days in sleep. He was affable in his behaviour, and his witticisms and satirical remarks appeared artless and natural. He was appointed proconsul of Bithynia, and afterwards consul, in both of which employments he behaved with all the dignity becoming the successors of a Brutus or a Scipio, but with his office he laid down his artificial gravity, and again gave himself up to the pursuits of pleasure. He did not long enjoy the imperial favours. Tigellinus, likewise one of Nero's favourites, jealous of his fame, accused him of conspiring against the emperor's life. The accusation was credited, and Petronius withdrew himself from Nero's punishments by a voluntary death. This was performed in a manner altogether unprecedented, A. D. 66. Petronius ordered his veins to be opened, but had them closed at intervals, until at last nature was exhausted. Petronius distinguished himself by his writings as well as by his luxury and voluptuousness. He is the author of many elegant but obscene compositions still extant, among which is a poem on the civil wars of Pompey and Cæsar.

There is also the feast of Trimalcion, in which he paints the pleasures and the debaucheries of a corrupted court and monarch, &c. The best editions of this classic are those of Burman at Utrecht, in 1709, and 1743; and that of Antonius at Leipsic, in 1783, with an excellent preface and several erudite notes.

PETRO-SALPINGO-STAPHILINUS, in myology. See **LEVATOR PALATI**.

PETROSELINUM. (from *παρα*, a rock, and *ωσινον*, parsley.) Common parsley. The **APIUM PETROSELINUM** of Linnæus, which see.

PETROSILEX, in mineralogy, a genus of the class earths, order siliceous. Consisting of the greater part silica, about 22 per cent of alumina, and 6 per cent of carbonat of lime; hardish, lightish; found in primæval stratified mountains, without lustre, breaking into indeterminate fragments, of a splintery texture; melting before the blow-pipe. Three species.

1. *P. apacus*. Hornstone. Chert. Nearly opaque, of a common form: sometimes with a texture resembling small splinters; sometimes with the colours alternating in strata; sometimes with a texture resembling larger splinters; sometimes of a greenish colour. Found in Sweden and Germany, forming veins and beds of mountains, and frequently in nodules like kernels in rocks; colour usually blue-grey, sometimes grey, blue and green of various shades; by breathing on it discovers an earthy smell, and is sometimes so hard as to strike fire with steel; it decomposes sooner than flint, and does not take so high a polish: in the fire it decrepitates and whitens: specific gravity from 2,699 to 2,708: contains,

Silica	-	-	-	72
Alumina	-	-	-	22
Carbonat of lime	-	-	-	6

100 *Kirwan.*

2. *P. diaphanus*. Semipellucid petrosilex. Silix petrosilex. Found with the last species; colour grey, white, ochraceous, rosy, flesh-colour, brownish-red, yellowish or reddish-brown, green or variegated: often receives a fine polish.

3. *P. crystallinus*. In rough crystals, which are frequently hollow within. These are of many varieties.

- a. In six-sided perfect prisms.
6. Six-sided prisms, terminated on each side by convex surfaces.
7. Six-sided prisms, terminated on each side by a three-sided pyramid.
8. Cubes.
- i. Six-sided tables.
- ç. Double four-sided pyramids.
- η. Double three-sided pyramids.
- θ. Double three-sided depressed pyramids.
- ι. Single three-sided minute pointed pyramids.

Found in Saxony near Schneeberg, sometimes covered with a thin earthy coating.

PETTAPOLLY, a seaport of Hindustan, on the coast of Coromandel, where the Dutch

have a factory, 42 miles S.W. of Masulipatam. Lon. 80 46 E. Lat. 15. 49 N.

PETTAW, a town of Austria, in the duchy of Suria. It belongs to the bishop of Saltsburg, and is seated on the Drave, 28 miles S. by E. of Gratz. Lon. 15. 37 E. Lat. 46. 46 N.

PETTEIA, in music, the last of the three parts into which the melopœia of the ancients was subdivided.

PETTICOAT. *s.* (*petit* and *coat.*) The lower part of a woman's dress (*Suckling*).

PETTIFOGGER. *s.* (corrupted from *petitoguer*; *petit* and *voguer*, French.) A petty small-rate lawyer (*Swift*).

PETTINESS. *s.* (from *petty*.) Smallness; inconsiderableness; unimportance (*Shakspeare*).

PETTISH. *a.* (from *pet.*) Fretful; peevish (*Creech*).

PETTISHNESS. *s.* (from *pettish.*) Fretfulness; peevishness (*Collier*).

PETTITOES. *s.* (*petty* and *toe.*) 1. The feet of a sucking pig. 2. Feet in contempt (*Shakspeare*).

PETTO. *s.* (Italian.) The breast; figuratively, privacy.

PETTY. *a.* (*petit*, French.) Small; inconsiderable; inferior; little (*Stillington*).

PETTY WHIM, in botany. See GENISTA.

PETTY (Sir William), son of Anthony Petty a clothier, was born at Rumsey, a little haven-town in Hampshire, in 1623; and while a boy took great delight in spending his time among the artificers there, whose trades he could work at when but twelve years of age. Then he went to the grammar-school there: at 15 he was master of the Latin, Greek, and French tongues, and of arithmetic and those parts of practical geometry and astronomy useful in navigation. Soon after he went to Caen in Normandy, and Paris, where he studied anatomy, and read Vesalius with Mr. Hobbes. Upon his return to England he was preferred in the king's navy. In 1643, when the war between the king and parliament grew hot, he went into the Netherlands and France for three years; and having vigorously prosecuted his studies, especially in physic, at Utrecht, Leyden, Amsterdam, and Paris, he returned home to Rumsey. In 1647, he obtained a patent to teach the art of double writing for seventeen years. In 1648, he published at London, Advice to Mr. Samuel Hartlib, for the Advancement of some particular Parts of Learning. At this time he adhered to the prevailing party of the kingdom; and went to Oxford, where he taught anatomy and chemistry, and was created a doctor of physic. In 1650, he was made professor of anatomy there, and soon after a member of the college of physicians in London. The same year he became physician to the army in Ireland; where he continued till 1659, and acquired a great fortune. After the Restoration, he was introduced to king Charles II. who knighted him in 1661. In 1662, he published A Treatise of

Taxes and Contributions. Next year he was greatly applauded in Ireland for his invention of a double-bottomed ship. He died at London of a gangrene in the foot, occasioned by the swelling of the gout, in 1687.

The character of his genius is sufficiently seen in his writings, which were much more numerous than those we have mentioned above. Amongst these, it is said, he wrote the history of his own life, which unquestionably contained a full account of his political and religious principles, as may be conjectured from what he has left us upon those subjects in his will. In that he has these remarkable words: "As for legacies to the poor, I am at a stand; and for beggars by trade and election, I give them nothing: as for impotents by the hand of God, the public ought to maintain them: as for those who can get no work, the magistrates should cause them to be employed; which may be well done in Ireland, where are fifteen acres of improveable land for every head: as for prisoners for crimes by the king, or for debt by their prosecutors, those who compassionate the sufferings of any object, let them relieve themselves by relieving such sufferers; that is, give them alms, &c. I am contented, that I have assisted all my poor relations, and put many into a way of getting their own bread, and have laboured in public works and inventions, and have sought out real objects of charity; and do hereby conjure all who partake of my estate, from time to time to do the same at their peril. Nevertheless, to answer custom, and to take the sure side, I give twenty pounds to the most wanting of the parish wherein I die." As for his religion, he says, "I die in the profession of that faith, and in the practice of such worship, as I find established by the laws of my country; not being able to believe what I myself please, nor to worship God better than by doing as I would be done unto, and observing the laws of my country, and expressing my love and honour to Almighty God, by such signs and tokens as are understood to be such by the people with whom I live." He died possessed of a very large fortune, as appears by his will; where he makes his real estate about 6500*l.* per annum, his personal estate about 45,000*l.* his bad and desperate debts 30,000*l.* and the demonstrable improvements of his Irish estate, 4000*l.* per annum; in all, at six per cent interest, 15,000*l.* per annum. This estate came to his family, who were afterwards ennobled. The present marquis of Lansdowne is a lineal descendant.

The great variety of topics on which sir William wrote successfully, prove the extent and fertility of his genius. A complete list of his works is given in Dr. Hutton's Mathematical and Philosophical Dictionary, to which we beg to refer the curious reader.

PETTY BAG, an office in Chancery, the three clerks of which record the return of all inquisitions out of every county, and make all patents of comptrollers, gaugers, customers, &c.

PETTY-CHAPS, in ornithology. See **MO-TACILLA**.

PETTY-FOGGER, a low tricking attorney, without either skill or conscience.

PETTY or **PETIT LARCENY**. See **LARCENY**.

PETTY or **PETIT TREASON**. See **TREASON**.

PETULANCE. **PE'TULANCY**. *s.* (*petulance*, French; *petulantia*, Latin.) Sauciness; peevishness; wantonness (*Clarendon*).

PETULANT. *a.* (*petulans*, Latin; *petulant*, French.) 1. Saucy; perverse (*Watts*). 2. Wanton (*Spectator*).

PETULANTLY. *ad.* (from *petulant*.) With petulance; with saucy pertness.

PETUNSE, in the arts, one of the principal substances made use of in the manufacture of porcelain: the other is kaolin. Petunse consists of

Silex	74
Alumina	14.5
Lime	5.5
	94.0

Kaolin consists of

Silex	74
Alumina	16.5
Lime	2
Water	7
	99.5

Therefore the two together consist of silex and alumina, with less than 5 per cent of lime. See **PORCELAIN**.

PETWORTH, a town in Sussex, with a market on Saturday; seated near the Arun, 12 miles N.E. of Chichester, and 49 S.W. of London. Lon. 0. 34 W. Lat. 50. 58 N.

PEUCEDANUM. Sulphur-wort. Meadow-saxifrage. In botany, a genus of the class pentandria, order digynia. Fruit ovate, striate on both sides, surrounded with a membrane; calyx five-parted; involucre very short; florets of the center abortive. Eleven species: for the most part natives of warm climates; two indigenous to our country, as follows.

1. *P. Silaus*. Common meadow saxifrage. Leaflets pinnatifid, with opposite decurrent segments; general involucre about two-leaved. Found wild in our meadows, and employed occasionally in medicine under the name of **SAXIFRAGA VULGARIS**, which see.

2. *P. officinale*, called by some medical writers *marathrum sylvestre*, *marathrophyllum*, or *pinastellum*. Hog's-fennel; horse-tongue; common sulphur-wort. Leaves five-times three-parted, with linear, undivided segments. Found wild in our ditches. The root is the official part; it has a strong fetid smell, somewhat resembling that of sulphureous solutions, and an acrid, unctuous, bitterish taste. Wounded when fresh in the spring or autumn, particularly in the former season, in which the root is most vigorous, it yields a considerable

quantity of yellow juice, which soon dries into a solid gummy resin, which retains the taste and strong smell of the root. This, as well as the root, is recommended as a nervine and anti-hysterical remedy.

PEUCESTES, a Macedonian, set over Egypt, by Alexander. He received Persia at the general division of the Macedonian empire at the king's death, and behaved with great cowardice after he had joined himself to Eumenes.

PEUCETIA, a part of Italy, near Campania, called also Mesapia and Calabria. It received its name from Peucetus, the son of Lycon, of Arcadia.

PEVENSEY, a village in Sussex, situate on a small river, which runs into a bay of the English Channel, called Pevensy Harbour, 14 miles W.S.W. of Hastings. Here is an ancient castle, which belonged to Robert earl of Moreton, and is said to be the largest and most entire remain of Roman building to be seen in Britain. Pevensy was anciently a famous haven, though now it is nearly two miles from the sea. Here Swain landed in 1049, when he carried off his cousin Beorn and murdered him: Godwin, and his son Harold, afterward ravaged it, and took away many ships: and here William the Conqueror landed when he invaded England.

PEW. *s.* (*puye*, Dutch.) A seat enclosed in a church (*Addison*).

PEWIT, in ornithology. See **TRINGA**.

PEWTER, a factitious metal, used in making domestic utensils, as plates, dishes, &c. The basis of this metal is tin, which is converted into pewter, by mixing at the rate of an hundred weight of tin, with fifteen pounds of lead, and six pounds of brass. Besides this composition, which makes the common pewter, there are other kinds compounded of tin, regulus of antimony, bismuth and copper, in several proportions. See **ZINCUM**.

PEWTERER, one who works in pewter.

PEYRERE (Isaac), librarian to the prince of Condé, and author of *Præadamitæ*, &c. a book condemned to the flames, and causing its writer to be imprisoned at Brussels. He was, however, released through the interest of the prince, and after some time retired to the Seminaire des Vertus, where he died, in 1676, aged 84.

PEZAY (Masson, marquis of), a native of Paris, and instructor in the art of tactics to Louis XVI. He was afterwards appointed inspector-general to the coasts, but dismissed and banished to his own estates for reasons not publicly known. He wrote *Les Soirées Helvétiennes*, with several other poems, as also *Les Campagnes de Maillebois*. He died in 1778.

PEZENAS (Esprit), a learned jesuit, of Avignon, in 1692, and some time professor of physic at Marseilles. His works and translations are numerous, and esteemed for the perspicuity of the language.

PEZIZA. Cap-mushroom. In botany, a

genus of the class cryptogamia, order fungi. Fungus concave, hæmispherical, or campanulate, without visible fructification. Seventy-two species, of which fifty-six are indigenous to our own country. They may be thus subarranged.

A. Sessile.

B. On a stalk, containing the larger number.

C. Gelatinous.

PEZRON (Paul), a very learned and ingenious Frenchman, born at Hennebon in Brittany in 1639, and admitted into the order of Citeaux in 1660. He was a great antiquary, and was indefatigable in tracing the origin of the language of the Goths; the result of which was, that he was led to espouse a system of the world's being much more ancient than modern chronologers have supposed. This he communicated to the public in a treatise printed at Paris in 1687, 4to, entitled, *The antiquity of Time restored*, and defended against the Jews and modern chronologers. This book of Pezron's was extremely admired for the ingenuity and learning in it; yet caused no small alarm among the religious, against whom he nevertheless defended his opinions. He went through several promotions, the last of which was to the abbey of Charmoye, to which he was nominated by the king; and died in 1706.

PPAFENHOFEN, a town of Upper Bavaria, with a Benedictine monastery at a small distance. It is seated on the Ilm, 19 miles N.W. of Ratisbon. Lon. 12. 3 E. Lat. 49. 27 N.

PFIRT, or FORETTE, a town of France, in the department of Upper Rhine, 10 miles W. of Basil. Lon. 7. 20 E. Lat. 47. 37 N.

PFORTZHEIM, a town of Suabia, in the marquisate of Baden-Durlach, with a castle, seated on the Entz, 15 miles S.E. of Durlach. Lon. 9. 46 E. Lat. 48. 57 N.

PFREIMB, a town of Upper Bavaria, with a castle, seated at the confluence of the Pfreint and Nab, 10 miles N.E. of Amberg. Lon. 12. 21 E. Lat. 49. 21 N.

PFULLENDORF, an imperial town of Suabia, seated on the Andalspatch, 37 miles S.W. of Ulen. Lon. 9. 27 W. Lat. 48. 8 N.

PHACA, in botany, a genus of the class diadelphia, order decandria. Calyx five-toothed, the two upper teeth more remote; legume half-two-celled, inflated. Twelve species, natives of the south of Europe and of Asia.

PHÆACIA, an island of the Ionian sea, near the coast of Epirus, afterward Corcyra. The inhabitants were a luxurious people, from which reason a glutton was generally stigmatized by the epithet of Phæax. When Ulysses was shipwrecked on the coast of Phæacia, Alcinoüs was then king of the island.

PHÆDON. The most remarkable of this name is a disciple of Socrates. He had been seized by pirates in his younger days, and the philosopher, who seemed to discover something

uncommon and promising in his countenance, purchased his liberty, and ever after esteemed him. The name of Phædon is affixed to one of the dialogues of Plato.

PHÆDRA, a daughter of Minos and Pasiphae, who married Theseus, by whom she became mother of Acamas and Demophoon. She conceived an unconquerable passion for Hippolytus, the son of Theseus, by the amazon Hippolyte. Phædra long attempted to stifle it, but in vain, and in the absence of Theseus, she addressed Hippolytus. Hippolytus rejected her with horror. Phædra, incensed on account of the reception she had met, at the return of Theseus, accused Hippolytus of attempts upon her virtue. The credulous father listened to the accusation, and without hearing the defence of Hippolytus, banished him, to punish him in some exemplary manner. As Hippolytus fled from Athens; his horses were suddenly terrified by a sea monster, which Neptune had sent on the shore. He was dragged through precipices and over rocks, trampled under his horses, and crushed under the wheels of his chariot. When the tragical end of Hippolytus was known at Athens, Phædra confessed her crime, and hanged herself in despair.

PHÆDRUS, the author of five books of Latin Fables in Iambic verse. He was a Thracian by birth, and contemporary with Julius Cæsar. He lived to be very old, and his being called Augustus's freedman shows that he had been a slave to that emperor. Under Tiberius he was unjustly persecuted by Sejanus, to which circumstance he has alluded in his Fables, and particularly in the preface to his third book. It is somewhat singular that the Roman language has been transmitted to posterity in its greatest purity and elegance by two slaves, who were brought from countries deemed barbarous: and it is no less remarkable that the Fables of Phædrus should remain buried in libraries unknown to the public, until discovered by Pithon, a learned Frenchman, at the close of the 16th century.

PHÆNOMENON. *s.* See PHENOMENON. This has sometimes *phænomena* in the plural. (φαινόμενον.) An appearance in the works of nature (*Newton*).

PHAETHUSA, in botany, a genus of the class syngenesia, order polygamia superflua. Receptacle chaffy; downless; seeds bristly; calyx imbricate; florets of the ray from one to three. One species, a North American tree eighteen feet high.

PHAETON, in fabulous history, a son of the Sun, or Phœbus and Clymene, one of the Oceanides, according to Ovid. Venus became enamoured of him, and entrusted him with the care of one of her temples. This favour of the goddess rendered him vain, and when Epaphus, the son of Io, had told him, to check his pride, that he was not the son of Phœbus, Phaeton resolved to know his true origin, and he visited the palace of the sun. He begged Phœbus, if he really were his father, to give him incontestable proofs of his

tenderness, and convince the world of his legitimacy. Phœbus swore by the Styx, that he would grant him whatever he required; and no sooner was the oath uttered, than Phaeton requested to drive his chariot for one day. Phœbus represented the dangers to which this would expose him, but in vain. He undertook the aerial journey, and the explicit directions of his father were forgotten. No sooner had Phaeton received the reins, than he betrayed his ignorance of guiding the chariot. The flying horses became sensible of the confusion of their driver, and immediately departed from the usual track. Phaeton repented too late of his rashness, and already heaven and earth were threatened with an universal conflagration, when Jupiter, who had perceived the disorder of the horses, struck the rider with a thunder-bolt, and hurled him headlong from heaven into the river Po. His body, consumed with the fire, was found by the nymphs of the place, and honoured with a decent burial. His sisters mourned his unhappy end, and were changed into poplars by Jupiter.

PHAETON, in ornithology, tropic-bird; a genus of the order anseres. Bill sharp-edged, straight, pointed, the gape of the mouth reaching beyond; nostrils oblong; hind-toe turned forward. Three species, as follow:

1. *P. æthereus*. Common tropic-bird. Body white; back, rump, and less wing-feathers streaked with white; two middle tail-feathers black at the base; bill red.

There are two other varieties, from a slight variation in the colours.

Inhabits the tropics, and are often seen upon the backs of porpoises; seldom on land, except in breeding time: about two feet ten inches long; flies very high; and feeds on fishes.

2. *P. melanorhynchus*. Black-billed tropic-bird. Streaked black and white, beneath white; bill black; quill-feathers tipped with white, tail-feathers with black. Inhabits Palmerston and Turtle Islands: nineteen and a half inches long.

3. *P. phœnicurus*. Red-tailed tropic-bird. Rosy flesh-colour; bill and two middle tail-feathers red. Inhabits Mauritius Island: two feet ten inches long, of which the two middle tail-feathers measure one foot nine inches; builds in hollows in the ground, under trees; and lays two yellowish-white eggs with rufous spots.

PHAETONTIADES or **PHAETONTIDES**, the sisters of Phaeton, who were changed into poplars by Jupiter.

PHAETUSA, one of the Heliades, changed into poplars after the death of their brother Phaeton.

PHAGEDE'NA. *s.* (*φαιγδαίνα*; from *φαγω*, to eat.) An ulcer, where the sharpness of the humours eats away the flesh.

PHAGEDENIC. **PHAGEDE'NOUS**. *s.* (*phagedenique*, Fr.) Eating; corroding (*Wise-man*).

PHALÆNA. Moth. In zoology, a genus

of the class insecta, order lepidoptera. Antennas gradually tapering from the base to the tip; tongue spiral; jawless; wings when at rest, generally deflected; flight nocturnal. Sixteen hundred species. These fly abroad only in the evening and during the night, and feed on the nectar of flowers: the larve is active and quick in motion, mostly smooth, more or less cylindrical, and preys voraciously on the leaves of various plants: pupa quiescent, more or less cylindrical, pointed at the tip or at both ends, and is generally inclosed in a follicle. They are divided into the following sections:

A. *bombyx*. Antennas filiform; feelers two, compressed, reflected; tongue short, membranaceous, obtuse, bifid; larve sixteen-footed, often hairy; pupa pointed at the tip. These are subdivided again:

α Wings expanded.

ς Wings reversed.

γ Wings deflected.

δ Wings incumbent.

ε Wings convolute.

B. *geometra*. Antennas filiform; feelers cylindrical; tongue projected, membranaceous, setaceous, bifid; larve eight or ten-footed; six of the feet pectoral, two caudal, and sometimes two subcaudal; pupa pointed at the tip. Thus again subdivided:

α Antennas pectinate.

ς Antennas setaceous.

γ Wings forked, connivent.

C. *noctua*. Antennas setaceous; feelers compressed, hairy, the tip cylindrical and naked; tongue projecting, horny, setaceous, bifid; larve sixteen-footed; pupa pointed at the tip. Subdivided as follows:

α Wings expanded.

ς Wings flat, incumbent; thorax smooth.

γ Wings flat, incumbent; thorax crested.

δ Wings deflected; thorax smooth.

ε Wings deflected; thorax crested.

D. *hyblœa*. Antennas setaceous; feelers projecting, compressed, dilated in the middle; lip projecting, acute.

E. *hepialus*. Antennas moniliform; feelers two, reflected, hairy, between them is the rudiment of a bifid tongue; larve sixteen-footed, that feed on the roots of plants; pupa folliculate, cylindrical, and pointed at the tip.

F. *cossus*. Antennas short, filiform; feelers two, very short, cylindrical, reflected; without spiral tongue.

G. *pyralis*. Antennas filiform; feelers two, equal, almost naked, cylindrical at the base, the middle dilated into an oval, and subulate at the tip; tongue projected, setaceous, bifid; wings very obtuse, and slightly curved at the exterior margin; larve sixteen-footed, rolling up the leaves to which it attaches itself.

H. *tinæa*. Antennas setaceous; feelers four, unequal; larve found in houses, among linen and woollen cloths and fur-

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niture, in which it eats holes and to which it is very destructive.

1. *allucita*. Antennas setaceous; feelers two, divided to the middle, the inner division very acute.

K. *pterophorus*. Antennas setaceous; feelers two, linear, naked; tongue exserted, membranaceous, bifid; wings fan-shaped, divided down to the base, and generally subdivided as far as the middle; larve sixteen-footed, ovate, hairy; pupæ naked, subulate at the tip.

The greater part of this numerous tribe, when at liberty in the fields, only fly during the night, or towards the evening: when domesticated in boxes made for that purpose, they give indications by their fluttering within when the natural period of their activity approaches. During the day they remain quiet, and apparently reconciled to their confinement; they flutter throughout the whole extent of their prisons towards the close of day, and testify their impatience at their want of freedom.

All the butterflies are provided with a rostrum for gathering, and for the reception of their food; a great part of the moths are entirely destitute of such an organ, while in others it is so small as scarcely to be discernible with the naked eye. This singular fact hath been fully investigated by the indefatigable Reaumur, who, after examining many moths with a strong magnifier, has not been able to trace the smallest vestige of a mouth. A considerable number, therefore, of these animals must pass the whole of their winged state without food; nor can they be destructive to vegetable or animal substances, except while they remain in the form of worms.

The larvæ or caterpillars from which the various species of moths are produced, exhibit nearly the same variety of appearance as the winged insects which spring from them. Some are large, while others are extremely minute; many are provided with ten, others twelve and fourteen feet; the largest and most common have sixteen. Some of the smaller caterpillars are smooth, and others covered with hairs, which produce an itching and an inflammation when they touch the human skin.

All the caterpillars of phalænæ, after having several times cast their skin, spin for themselves the materials of a habitation, in which they are to be transformed into chrysalids. Of all the inventions of insects to protect themselves during this state of imbecility, that practised by the silk worm is most universally known; and if animals acquire a consequence or reputation from their connection with man, and the conveniences with which they accommodate him, this insect may challenge, perhaps, a larger share of it than any other animal whatever. Our luxury has brought silk into such general request, that it may now be deemed a necessary of life: the poor, in some countries at least, would find it almost impossible to procure the necessary articles of clothing, were woollen

stuffs worn by all those who at present are supplied with silk.

The produce of the phalænæ mori, or common silk worm, has been found most proper for the purpose of manufacturing. That glutinous substance with which the silk of this species is always covered when it first comes from the worm, and which gives it that adhesive quality so proper for constructing their edifices, sooner dries than in that of any other insect. The cods constructed by some other species are so firmly glued together, that no operation can separate the threads. The produce of many is by far too fine for any purpose in our manufactures, while that of another class is too coarse.

Several very laudable attempts have been made, but hitherto without any considerable degree of success, to rear the silk worm in Britain. The public have lately been informed by a manufacturer of Paisley of his having prepared a web entirely of the silk produced by worms of his own rearing. And in the transactions of the society for the encouragement of arts, manufactures, and commerce, a number of very useful experiments are recorded with regard to the food and management of these insects.

Probably the want of a sufficient number of mulberry trees has hitherto rendered ineffectual the efforts of our countrymen to introduce and rear any considerable quantity of silk worms. From the attempts that have already been made, it appears that the white mulberry is preferable to the black in feeding, and that the latter is to be preferred to the lettuce. Twelve cocoons, the produce of worms fed upon the white mulberry, weighed seven penny-weights two grains; while an equal number of those that had been fed upon the black mulberry weighed only six penny-weights three grains: six penny-weights were obtained from the same number of worms fed upon common lettuce.

Endeavours to produce raw silk in our own country seem the more worthy of encouragement, as we appear to possess some advantages of which Italy and many other silk countries are destitute. In Italy the chrysalids so soon come to life, that it is necessary to destroy them, lest, by eating their way out, they should injure the silk. In order to effect this, they are collected and placed in heated ovens, where again the silk, without singular caution, is apt to be damaged. In our own climate, where every progression of the insect tribe is slower, there is sufficient time to wind off the silk without killing the chrysalis.

But beside the injury that may be done to the silk in Italy, from the length of time which it is necessary to keep the chrysalis in these ovens, they are there obliged to suffer the moth to eat its way out of the largest cones, in order to have eggs from the most vigorous and healthy. Hence they lose all the silk of these cones, which, in our own country, might be gathered while the moths are preserved. Thus we seem to possess two striking advantages,

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which may probably compensate for the want of others which our climate has denied us.

Yet our climate itself is in some respects superior to those where silk is raised. In the south of France the frosts are often so intense as to kill the mulberry leaves after they are out. At that season of the year, this is seldom the case in England; which is also more free from lightning, and those sultry heats that have always been deemed prejudicial to the silk worm. From such considerations the time may perhaps arrive when our countrymen, by farther knowledge and experience, may be enabled to avail themselves of these exclusive advantages, and become entitled to a rank as distinguished among the raisers, as that which they have long held among the manufacturers of silk.

The silk worm, however, is far from being the only insect of whose labours man might probably avail himself. There are many species very common, and immensely fertile, that might be beneficially employed in procuring silk, did we know how to profit of their labours. M. de Reaumur has mentioned several whose productions deserve a trial, although we are aware that the silk of many of them is altogether unfit for our purposes; their coques being not only coarse, but so scantily provided with silk, that the animal is obliged to join dry leaves, bits of wood, and other materials, in order to give stability to its edifice. Some of them indeed spin under ground, and their work consists only of joining and connecting together, by means of their threads, different particles of earth, of which their house is composed. These caterpillars, when kept by the naturalist, who waits for their perfect form, must be supplied with earth in the boxes in which they are lodged; otherwise they will perish, from not being able to construct an edifice fit for their reception.

The moths differ from the butterflies in remaining in their chrysalid state for a much longer period before their metamorphoses into perfect insects is completed. Their form, too, is then different, being oblong, and not angular, like the chrysalid of the butterfly. Some remain in their coques for several years successively; especially if a cold damp situation have retarded their progress. So great is the effect of heat in precipitating their developements, that a moth in a warm exposure may be produced from its chrysalid, even in the depth of winter.

After the phalænæ issue from their last covering, some of them are destitute of wings: these are the females of certain kinds, who, instead of wings, have only short protuberances, altogether unfit for the purpose of flying. They have the appearance of large creeping animals of a different order, and can only be recognised for moths by the shape of their antennæ, which are similar to those of the males, and by those scales with which the body of these animals is covered.

Though the moths do not in general fly by

day, yet it is the light which, at evening, attracts them into the dwellings of man: then it is that they are seen entering the rooms, and fluttering around the candles, where they often meet with a painful death. This fondness for light has suggested to the curious a method of catching moths, by carrying a lantern into a bower, around which they all flock, when the greater part may be led into captivity.

Out of this almost innumerable tribe of insects we can select but a few specimens.

1. *P. mori*. Common silk worm. Wings pale, with three obsolete brown streaks. We have already made some observations on the produce of this curious moth, and have now only to remark that, in its native state, it inhabits China, on the mulberry tree, whence its specific name, and was introduced into Europe in the reign of the emperor Justinian: it is the fine silky threads which compose the follicle of the pupæ, that are converted into that valuable article of commerce and luxury, in our own country denominated silk. This species belongs to the partition bombyx: the larvæ is characterised by having the tail naked and whitish; the pupæ is folliculate, reddish-brown.

2. *P. atlas*. Wings foliate, varied with yellow, white, and ferruginous, with a transparent spot on each, that on the upper pair with a contiguous smaller one. This is the largest and most splendid of all the phalænæ yet known: the extent of its wings measures not less than eight inches and a half. It is a native of both the Indies; and occasionally varies in size and colours. It belongs to the partition bombyx: the larvæ is verticillate with hairy tubercles, and spins a web of very strong yellowish silk.

3. *P. luna*. Wings tailed, both surfaces alike; colour elegant peagreen, with a transparent lunule eye on each wing; the upper wings have a dark-brown rib which extends across the thorax; body covered with white wool. It inhabits North America.

4. *P. pavonia*. Wings rounded, clouded with grey and barred with grey beneath, each of them with a nictitant semitransparent eye. The most beautiful European insect of the bombyx partition: its wings, when extended, measure about six inches. It is subject to several varieties in its size, and the disposition of its markings; the larvæ is gregarious and green, verticillate with red or yellow, hairy protuberances; pupæ blackish, folliculate, with an elastic aperture at the rib. It is occasionally found in our own country.

5. *P. sambucaria*. Wings tailed, angular, yellowish with two darker streaks; lower ones with two reddish dots at the tip. It is an elegant moth, of a pale sulphur colour, found in June and July on the leaves of the elder tree, whence its specific name. Its chrysalis is black, and may be readily traced in the month of May in the same situation. It belongs to the partition geometra.

6. *P. vestianella*. Cloth-moth. Wings

cinereous with a white rib, the tips ascending and feathered. This insect belongs to the tineæ division, and is the common moth found in cloths and woollen furniture, and so destructive to them.

7. *P. sarcitella*. Wings cinereous, thorax with a white dot on each side. This also belongs to the division tineæ, and is found in skin-cloths and woollen furniture, to which; like the last, it proves terribly destructive.

These moths construct the abode in which they reside of the grains of wool or other materials, which they gnaw off. Their food is of the same substance; and what greatly increases the extent of their devastations is, that every step they advance upon cloth, feeling themselves incommoded by the wool in their way, they gnaw a smooth passage for themselves, like a man with a scythe in his hand, cutting down the grass of the meadow as he proceeds. Hence these species are among the most destructive of the tribe. The most costly articles of fur are those which are not worn every day; and for this very reason they are most exposed to their attacks. The methods for preventing their devastations may be reduced to the two following; either we must destroy the insects, or render our clothes disagreeable food for them. The insects may be destroyed by oil, or the fumes of tobacco; and the material may be rendered nauseous to them, and thus escape their ravage by having intermixed with them fragments of Russia leather or other skins, that emit and retain a strong animal odour; and it is probably on this account, though the odour is far less powerful, that this insect never commits its depredations on wool while on the back of the sheep.

8. *P. pentadactyla*. Body and wings snowy; upper pair bifid, lower ones three-parted. A very beautiful European species, a native of our own country and of other parts of Europe; size minute; the wing divided apparently into plumes, the upper by a delicate midrib consisting of two, the lower of three, with innumerable lateral fibres. The larve is sixteen-footed, hairy, green, with black dots, and a white dorsal line; pupæ hairy-green, dotted with black. This insect belongs to the division pterophorus, which constitutes a part of the alucia of Gmelin.

9. *P. hexadactyla*. Wings cleft, cinereous, spotted with brown, all of them six-parted. This also belongs to the division pterophorus: it inhabits England, and Europe generally, and is found on the *loriscera xylostium*, or honey-suckle; and is likewise a most elegant and beautiful insect. It often appears before our windows, and flies in, when they are open, in a still and warm evening in September. See Nat. Hist. Pl. CLXVI.

PHALANGES, in mastiology. See DELPHIS.

PHALANGIUM, in zoology, a genus of the class insecta, order aptera. Mouth with horny mandibles, the second joint with a very sharp, moveable, cheliferous tooth; feelers

filiform; antennae; eyes two on the crown and two at the sides; legs eight; abdomen generally rounded. These, in their various stages of transformation, prey on the smaller insects and worms: the larve and pupæ are active, eight-footed, and resemble the perfect insect. Nineteen species, thus subdivided:

A. Mouth with a conic tubular sucker.

a Feelers four, the upper one chelate.

This tribe constitutes the nymphon of Fabricius.

c Feelers two. The pycnogonum of Fabricius.

B. Mouth without a sucker.

a Feelers projecting, incurved. The phalangium of Fabricius.

c Feelers thick, spinous, and furnished with a claw at the tip.

The general form of this family of insects resembles that of the crab. Like the crab race, too, some of the species are terrestrial, and some aquatic, and they have all a wonderful power of shaking off a limb when entangled, and the whole animal is in danger. The following are chiefly worth notice.

1. *P. grossipes*. Body minute, cylindrical, glabrous; shoulders tuberculate; legs very long; body dirty-red, very minute and slow. Inhabits European seas; and insinuates itself into the shells of muscles, and destroys the fish.

2. *P. opilio*. Long-legged spider. Shepherd spider. Harvest spider. Abdomen ovate-grey, beneath whitish. Inhabits Europe and America, and wanders about by night; and is said by some naturalists, but perhaps erroneously, to be the insect that produces many of those gossamer threads with which the grass, stubble, and ground, are so thickly covered in the course of a single night in the autumn. The legs are uncommonly long and slender: when caught by one or them, the insect parts with it to save his body, and makes off without any apparent uneasiness; a faculty in which, as we have already observed, it resembles the crab and lobster, whose loss is quickly repaired by the growth of a new limb. No experiments, however, have yet ascertained whether the power of reproducing their limbs belong also to the insects of this genus.

3. *P. areoides*. Chelæ or claws toothed, villous; body oblong, soft, livid, woolly, with inflated claws. Inhabits the Cape of Good Hope, and the southern parts of Russia. Its bite is extremely poisonous, occasioning livid tumours, and sometimes death.

4. *P. cancröides*. Abdomen obovate, depressed, ferruginous; chelæ or claws oblong, hairy. Inhabits Europe in cellars and other damp places; and is the little insect that gets into our legs and under the skin in the summer season, causing a painful itching.

There is another variety with ovate chelæ, the scorpion *cimicoides* of Fabricius.

5. *P. acaroides*. Abdomen cylindrical, yellowish; chelæ ovate, smooth. Inhabits Ame-

rica: twice as large as *P. cancrroides*: and its bite said to be extremely painful and dangerous. See Nat. Hist. Pl. CLXIII.

PHALANGOSIS, in surgery, is a tumor and relaxation of the eye-lids, often so great as to deform the eye, and considerably to impede vision. Sometimes the eye-lid when in this state subsides or sinks down, occasioned perhaps either by a palsy of the muscle which sustains and elevates the eye-lid, or else from a relaxation of the cutis above, from various causes. Sometimes an oedematous or aqueous tumor is formed on the eye-lids, so as almost entirely to exclude vision.

PHALANX, in Grecian antiquity, a square battalion, consisting of 8000 men, with their shields joined, and pikes crossing each other, so that it was next to impossible to break it.

Hence phalanx is now often used to denote a troop of men closely embodied

PHALANX is employed by anatomists to the three rows of small bones which form the fingers. See **ANATOMY**, **FINGERS**, &c.

PHALARIS, a cruel tyrant of Agrigentum. Perillus made him a brazen bull, and when he had presented it to Phalaris, the tyrant ordered the inventor to be seized, and the first experiment to be made on his body. These cruelties did not long remain unrevenge; the people of Agrigentum revolted in the tenth year of his reign, and put him to death in the same manner as he had tortured Perillus, and many of his subjects. (*Ovid. Juv.*)

PHALARIS. Canary grass. In botany, a genus of the class triandria, order digynia. Calyx two-valved, one-flowered; carinate equal, longer than the corol. Eleven species: natives of India, the Cape, and south of Europe; three of them are common to our own road-sides or sandy fields. Of these *P. canariensis* is cultivated for the sake of its seeds, which are found to be the best food for canary and other small birds. It is found wild on our road-sides, with panicle awnless, ovate, spikeform; glumes of the calyx boat-shaped, entire: corol four-valved; the outer valves lanceolate, glabrous; inner villous.

PHALAROPE, in ornithology. See **TRINGA**.

PHALEUCIAN VERSE, in ancient poetry, a kind of verse which consists of five feet, the first of which is a spondee, the second a dactyl, and the three last trochees: such is the following one of Martial:

1 2 3 4 5
Summam | nec metu | as di | em, nec | optes.

PHALLICA, festivals observed by the Egyptians in honour of Osiris. They receive their name from φαλλος, *simulacrum ligneum membri virilis*. The institution originated in this: after the murder of Osiris, Isis, unable to recover the privities of her husband (see **OSIRIS**,) distinguished that which was lost with more honour than the parts recovered. Its representation, called phallus, was made of wood, and carried during the sacred festivals instituted in honour of Osiris. The people

looked upon it as the emblem of fecundity, and the mention of it among the ancients, it is said, though not very truly, we apprehend, never conveyed any impure thought or lascivious reflection. The festivals of the phallus were imitated by the Greeks, and introduced in Europe by the Athenians, who made the procession of the phallus part of the celebration of the Dionysia of the god of wine.

PHALLUS. Morel. In botany, a genus of the class cryptogamia, order fungi. Fungus reticulate above, even beneath; seeds in the reticulations.

Nine species, of which the three following are common to our own country.

1. *P. esculentus*. Esculent morel. Ovate, cellular, attached at the margin: plaits undulate, anastomosing. This species is found in woods, meadows, and pastures. The substance, when recent, is wax-like and friable, of a whitish-yellow colour, changing to brownish as it decays: the height of the entire fungus being four or five inches. The stalk is thick and clumsy, somewhat tuberous at the base and hollow in the middle. The pileus is either round or conical: at a medium about the size of an egg, often much larger; hollow within; its base united to the stalk, and its surface cellular or latticed with irregular sinuses. The seeds, when magnified, are oval. It is in great esteem, both recent and dried, as an ingredient to heighten the flavour of ragouts. Gleditch asserts that being observed to grow in abundance in the woods in Germany where charcoal has been made, the women who gather them for sale have long been accustomed to make fires in different parts of such woods, with heath, broom, vaccinium, and other materials, in order to obtain a more plentiful crop. From this practice, however, woods have often been set on fire to a considerable extent, and accompanied with great danger; in consequence of which the practice has of late been prohibited.

2. *P. impudicus*. Stinking morel. Stink-horns. Found in woods and on banks. It arises from the earth under a veil or volva, shaped exactly like a hen's egg, of the same colour, having a long fibrous radicle at its base. As the volva grows it bursts suddenly into several lacerated, permanent segments, from the centre of which arises an erect, white, cellular, hollow stalk, about five or six inches high, and one thick, of a wax-like friable substance, and most fetid cadaverous smell, conical at each end, the base inserted in a white, concave, membranaceous, turbinated cup, and the summit cupped with a hollow conic pileus. As soon as the volva bursts the plant begins to diffuse its intolerable stench, which is so powerful and widely expanded that the fungus may be discovered by the scent alone, long before it appears to the sight.

3. *P. caninus*. Dog-morel. Of an ovate form, with undulate plaits or segments, anastomosing with each other. Found also in woods and wild banks.

PHALLUS, in antiquity. See **PHALLICI**.

PHANATIC. See **FAN**.

PHANATIC, or **FANATIC**, a visionary; one who fancies he sees spectres, spirits, apparitions, or other imaginary objects, even when awake; and takes them to be real. Such are phrénetics, necromancers, hypochondriac persons, lycanthropi, &c. See **PHRENETIC**, **HYPOCHONDRIAC**, **LYCANTHROPI**. Hence the word is also applied to enthusiasts, pretenders to revelation, new lights, prophecies, &c.

PHANTASIA, a daughter of Nicarchus, of Memphis, in Egypt, supposed to have written a poem on the Trojan war, and another on the return of Ulysses to Ithaca, from which compositions Homer copied the greatest part of his Iliad and Odyssey, when he visited Memphis.

PHANTA'SM. **PHANTA'SMA**. *s.* (*φαντασμα, phantasma, phantasme, phantasie, Fr.*) Vain and airy appearance; something appearing only to imagination (*Raleigh*).

PHANTASMAGORIA, an appellation lately given to an exhibition of curious optical illusions in London. Though it will be difficult, we apprehend, to prove any exclusive property in phenomena that every experimental philosopher must have practised on a smaller scale, this has been the subject of a patent granted to Mr. Philipshall, of the Lyceum, in the Strand, who describes his method of representing, in a dark space or scene, human figures, in various characters, proportions, and sizes.

"The apparatus of some of these exhibitions," says he, "consists of two concave glasses, or rather two concave metal reflectors, before which an artificial light, proportionable to their focus, is applied.

"These enlightened concave metal reflectors are secured in a closet or box proportionable to their size, and their requisite light, in such a manner that all the rays of light are directed upon a transparent picture, representing the apparition; which picture reflects, by means of lenses, upon a transparent body, and giving the necessary direction to this apparatus, according to the nature of its circumstances, in such a manner that the apparitions represent themselves to the eye of the spectator arbitrarily, either in a larger or smaller, in a nearer or more distant perspective point of view.

"In the same manner I can likewise represent landscapes and buildings in a very striking and deceiving manner, in a voluntary size.

"Another sort of apparition is produced by the refraction of light, by means of transparent bodies, of various shapes and sizes, which are fixed in a dark closet as aforesaid, and, by means of the refraction of an artificial light, are either made visible or invisible. If those bodies are made to liken deceased persons which are required to be seen, then the apparition is the more striking, and answers fully the ideas commonly formed of a spectre.

"A third sort of these optical deceptions I produce in the following manner, viz. By opaque moveable figures of various sizes and

shapes. These are moderately enlightened by the refraction of a concave metal reflector, fixed in a dark closet; but the rays of light must be properly distributed by the refraction of a lens, of a proportionable focus, in order that the enlightened object may alone represent itself to the eye; if therefore, according to the description, the enlightened figures imitate mechanically the motions of men, and appear in proper dress or draperies, then this becomes the most striking illusion, as one may by this regulation, by giving an easy motion to their drapery, produce various groups, and pantomime scenes, out of the world of spirits.

"A fourth sort of optical illusion is operated in the following manner, in order to produce a multiplicity of apparitions. There is between the transparent body upon which the figures reflect, another dark body slipped in, upon which a fixed number of figures are applied, and are distributed in a symmetrical manner; upon these figures either a greater or less light is directed, according to the disposition of the groups, and gives to the apparatus the necessary direction, in order that those which reflect upon the transparent bodies may move through one another, and form all manner of groups; the positions of which are very comic and striking, and they procure the most agreeable entertainment." (*Rep. Arts. No. 95.*)

This specification, which, it must be confessed, is far from perspicuous, ought to have told, that the phantasmagoria consist of a striking application of the magic lantern. The novelty consists in placing the lantern on the opposite side of the screen which receives the images, instead of on the same side as the spectator, and suffering no light to appear, but what passes through and tends to form those images. Mr. P.'s sliders are therefore perfectly opaque, except that portion upon which the transparent figures are drawn, and the exhibition, as Mr. Nicholson informs us, is thus conducted.

All the lights of the small theatre of exhibition were removed, except one hanging lamp, which could be drawn up so that its flame should be perfectly enveloped in a cylindrical chimney, or opaque shade. In this gloomy and wavering light the curtain was drawn up, and presented to the spectator a cave or place exhibiting skeletons, and other figures of terror, in relief, and painted on the sides or walls. After a short interval the lamp was drawn up, and the audience were in total darkness, succeeded by thunder and lightning; which last appearance was formed by the magic lantern upon a thin cloth or screen, let down after the disappearance of the light, and consequently unknown to most of the spectators. These appearances were followed by figures of departed men, ghosts, skeletons, transmutations, &c. produced on the screen by the magic lantern on the other side, and moving their eyes, mouth, &c. by the well known contrivance of two or more sliders. The transformations are effected by moving the adjusting tube of the lantern out of its focus, and changing the

slider during the moment of the confused appearance.

It must be again remarked, that these figures appear without any surrounding circle of illumination, and that the spectators, having no previous view or knowledge of the screen, nor any visible object of comparison, are each left to imagine the distance according to their respective fancy. After a very short time of exhibiting the first figure, it was seen to contract gradually in all its dimensions, until it became extremely small and then vanished. This effect, as may easily be imagined, is produced by bringing the lantern nearer and nearer the screen, taking care at the same time to preserve the distinctness, and at last closing the aperture altogether: and the process being (except as to brightness) exactly the same as happens when visible objects become more remote, the mind is irresistibly led to consider the figures as if they were receding to an immense distance.

Several figures of celebrated men were thus exhibited with some transformations; such as the head of Dr. Franklin being converted into a skull, and these were succeeded by phantoms, skeletons, and various terrific figures, which instead of seeming to recede and then vanish, were (by enlargement) made suddenly to advance, to the surprise and astonishment of the audience, and then disappear by seeming to sink into the ground.

For another description of these interesting illusions, see the notes to Gregory's Translation of Haüy's Philosophy, vol. ii. page 390.

PHANTASTICAL. See **FANTASTICAL**.

PHANTACY. See **FANCY**.

PHANTOM. *s.* (*phantome*, Fr.) 1. A spectre; an apparition (*Atterbury*). 2. A fancied vision (*Rogers*).

PHAON, a boatman of Mitylene in Lesbos. He received a small box of ointment from Venus, with which, as soon as he rubbed himself, he became one of the most beautiful men of his age. Many were captivated with Phaon, and among others, Sappho, the celebrated poetess. Phaon gave himself up to Sappho's company, but however, he soon conceived a disdain for her, and Sappho, mortified at his coldness, threw herself into the sea.

PHARAMOND is the name which is given by the generality of historians to the first king of France. He is said to have reigned at Treves, and over a part of France, about the year 420; and to have been succeeded by his son Clodion: but the account which is given of these two princes is very uncertain. He is said to be the author of the famous Salique law, which forbade the succession of females.

PHARAOH, a common name of the kings of Egypt. Of these ten at least are mentioned in the Hebrew Scriptures.

PHARAON is the name of a game of chance, the principal rules of which are: The banker holds a pack, consisting of 52 cards; he draws all the cards one after the other, and

lays them down alternately at his right and left hand; then the ponte may at his pleasure set one or more stakes upon one or more cards, either before the banker has begun to draw the cards, or after he has drawn any number of couples. The banker wins the stake of the ponte when the card of the ponte comes out in an odd place on his right hand, but loses as much to the ponte when it comes out in an even place on his left hand. The banker wins half the ponte's stake when it happens to be twice in one couple. When the card of the ponte, being but once in the stock, happens to be the last, the ponte neither wins nor loses; and the card of the ponte being but twice in the stock, and the last couple containing his card twice, he then loses his whole stake. De Moivre has shown how to find the gain of the banker in any circumstance of cards remaining in the stock, and of the number of times that the ponte's card is contained in it. Of this problem he enumerates four cases, viz. when the ponte's card is once, twice, three, or four times in the stock. In the first case,

the gain of the banker is $\frac{1}{n} \cdot n$ being the number of cards in the stock. In the second case,

his gain is $\frac{(n-2) \times y}{n(n-1)} + \frac{2}{n \times (n-1)}$, or

$\frac{\frac{1}{2}n + 1}{n \times (n-1)}$ supposing $y = \frac{1}{2}$. In the third

case, his gain is $\frac{3y}{2 \times (n-1)}$, or $\frac{3}{n \times (n-1)}$ sup-

posing $y = \frac{1}{2}$. In the fourth case, the gain of the banker, or the loss of the ponte, is

$\frac{2n-5}{(n-1) \times (n-3)} y$, or $\frac{2n-5}{2 \times (n-1) \times (n-3)}$

supposing $y = \frac{1}{2}$. De Moivre has calculated a table, exhibiting this gain or loss for any particular circumstance of the play; and he observes, that at this play the least disadvantage of the ponte, under the same circumstances of cards remaining in the stock, is when the card of the ponte is but twice in it; the next greatest when three times, the next when once, and the greatest when four times. He has also demonstrated, that the whole gain per cent. of the banker upon all the money that is adventured at this game, is 2l. 19s. 10d. See De Moivre's Doctrine of Chances, page 77, &c. p. 105, &c.

PHARISAICAL. *a.* (from *pharisee*.) Ritual; externally religious; from the sect of the Pharisees, whose religion consisted almost wholly in ceremonies (*Bacon*).

PHARISEES, a celebrated sect among the ancient Jews; so called, say some, because separated from the rest by the austerity of their life, and by their professing a greater degree of holiness, and a more religious observation of the law.

This is the import of the word פָּרִישִׁי in the Hebrew, or rather Chaldee tongue; whence is

formed the Greek *Φαρισαῖοι*, and the Latin *Pharisæus*. St. Jerom, and several of the rabbins, maintain this etymology; which is very agreeable to the state and character of the Pharisees; who were not only distinguished from the rest by their manner of life, but by their habit. However, others, with less probability, have derived the name from *פָּרַשׁ* *exposuit*, because the Pharisees were in the highest reputation for expounding the law.

It is very difficult to fix the precise origin of the Pharisees. The Jesuit Serrarius places their first rise about the time of Esdras; because it was then that the Jews first began to have interpreters of their traditions. Maldonat, on the other hand, will not have this sect to have arisen among the Jews, till a little before the time of Christ. Others, perhaps with more probability, refer the origin of the Pharisees to the time of the Maccabees.

Josephus, who describes their dogmata, says, that they attributed all to destiny, and to God; so, however, as not to deprive man of his free agency; which Sixtus of Sienna thus explains: the Pharisees believed, that all things were done by destiny, i. e. with God's foreknowledge, and in consequence of his immutable decree; the will of man still remaining free and unaffected: *Fato, hoc est, Dei præscientia, & immobili decreto, omnia geri; manente tamen libero humanæ libertatis assensu.*

They owned the immortality of the soul, a resurrection, and a future state; but they admitted, at the same time, as some have supposed, a kind of metempsychosis, or transmigration of souls: They also held the doctrine of angels, and separate human spirits.

PHARMACA, among the ancients, meant medicated or enchanted compositions of herbs, minerals, &c. some of which, when taken inwardly, were supposed to cause blindness, madness, love, &c. others infected by touch; such was the garment sent by Medea to Creusa, prepared *secundum artem*; and others operated upon persons at a distance.

PHARMACEUTICAL. **PHARMACEUTIC**. *α. (Φαρμακευτικός, from φαρμακῆν) Relating to the knowledge or art of pharmacy, and preparation of medicines.*

PHARMACI, in antiquity, were two persons who were employed in the illustration or purification of cities.

PHARMACOLITE. *Chaux arseniatée.* Haüy. A mineral of a snow-white colour; occurring in small crystals occasionally prismatic, but more commonly circular; sometimes the crystals are aggregated into bundles, and sometimes into masses of other forms. Internally it is glistening with a silky lustre: its fracture is radiated or divergingly fibrous; it also presents large and small granular distinct concretions. The crystallized varieties are translucent. It is very tender, and easily frangible.

It is soluble in nitric acid without effervescence. By the action of the blow-pipe it disengages an arsenical odour, and leaves an insolubilizable residue.

By the experiments of M. Selb, it was first ascertained to be a compound of lime and arsenic acid with a little cobalt: a result which has been fully confirmed by a complete analysis of it by Klaproth.

One hundred grains of this mineral, according to the celebrated chemist last mentioned, lose, by being moderately heated, and without the disengagement of any arsenical or other odour, or visible vapour, 22.5 grains which are water of crystallization. The residue by digestion in nitric acid is dissolved, except six grains which are a mixture of silex and alumine. The nitrous solution affords with acetite of lead a copious precipitate of arseniat of lead which, when washed and dried, weighed 138 grains, and indicated 46.5 of arsenic acid. The remaining fluid, with the washings, was moderately evaporated and treated with a little muriatic acid, to separate the small portion of acetited lead which it contained, and was then mixed with sulphuric acid. This produced a large deposit of sulphat of lime, which after being washed with dilute spirit of wine and heated to redness, weighed 54 grains, and therefore contained 23 grains of lime. The residual liquor being neutralized by carbonated soda, and evaporated to dryness, was dissolved in water, and left behind 0.5 grains of a blue powder, which tinged borax of a deep blue colour, and was oxyd of cobalt. Hence 100 parts of pharmacolite contain

46.5 Arsenic acid,
23. Lime,
0.5 Oxyd of cobalt,
6. Silex with alumine,
22.5 Water.

98.5

of these the first three ingredients appear to be the only ones necessary to the constitution of this mineral.

It has been found near Withchen in Swabia in a vein of granite, accompanied by heavy spar and gypsum. It has also been met with at St. Marieaux mines in France.

PHARMACOLOGIST. *s. (φαρμακων λεγων.)* One who writes upon drugs (*Woodward*).

PHARMACOLGY. *s. (φαρμακων λεγων.)* The knowledge of drugs and medicines.

PHARMACOPŒIA. (*φαρμακοποια* from *φαρμακων*, a medicine, and *ποιω*, to make.) A dispensatory; or compilation of medical materials. The term has of late years, however, been confined almost entirely to a dispensatory published by authority; almost every government in Europe having been long aware of the expediency, and indeed necessity, of having some regular standard by which to regulate official compositions and preparations. The first work of this kind published by authority appears to have been the dispensatory of Valerius Cordus, introduced to the world in 1542, under the sanction of the senate of Nuremberg. It is for the most part a compilation

PHARMACOPŒIA.

from Mesue and Nicholas of Salerno; and retains some degree of celebrity even in the present day, from Hoffman's numerous references to it. The Pharmacopœia Bergamensis followed it in 1581, under the authority of the senate of Bergamo: and to this succeeded the Augustan pharmacopœia, first published at Augsburg in 1601, and afterwards at Rotterdam in 1653, with many valuable notes by Zwelfer. The former of these two editions may be esteemed the basis of the best pharmacopœias of modern times; the earliest of the London college, published in 1618, and of the Paris school, published in 1637, are distinctly founded upon it. Since this period pharmacopœias of authorised form have become so numerous, that it would be tedious and useless to run over even a muster roll. We shall only, therefore, observe upon them generally, that the three colleges of London, Edinburgh, and Dublin have now pharmacopœias of great value and genuine science: all of them published since the beginning of 1803, and the last edition of the London as recently as 1809.

Concerning this last, therefore, which ought to be regarded as the most complete of the whole, it may be expected that we should offer a few particulars. A period of twenty-two years had existed since the publication of the preceding edition; and hence it may well be expected that many preparations and terms but ill accorded with the actual state of the medical art, and more especially with the actual state of chemistry and natural history.

In the general arrangement some alteration has been made, and a greater degree of simplicity hereby obtained: but we discover no aim at any thing like scientific grouping, although without such an endeavour a common alphabetic succession might have answered as well as any other. Hence, while some of the metallic preparations are given under the heads of the substances to which they belong simply and chemically, others are given under the heads of the mere colours they produce when dissolved in spirits of wine; and the different preparations of the same substances are thus perpetually separated at a wide distance from each other. These disjunctions of different forms of the same substance are very numerous, and in various instances very incondite. The nomenclature is considerably improved upon the whole; it is in some instances, as in the case of anthesis and cusparia, pressed a little too far, and perhaps in the case of potassa and soda, which are now universally acknowledged to be oxyds of metals, not quite pressed far enough. The college, in an elegant Latin preface, complains of the horrid barbarity of the first of these words; and it might have complained equally of the second, although not quite so disgusting in pronunciation: but it should not only have complained, it should have corrected; there was no necessity for either of these terms, at least in a medical contemplation of the science. Cetaceum is elegantly adopted for sperma ceti;

octarius is perhaps preferable to congius, though the alteration was hardly called for; fluidunica and fluidrachma are rather fitted for the meridian of Germany than of England; but minimum is certainly a better term, and subject to better regulations than gutta.

The preparations and compounds are exhibited under the following heads:

Acida	Spiritus
Alkalia et eorum	Tincturæ
Sales	Ætherea
Terræ et eorum	Vina
Sales	Acetica
Sulphurea	Mellita
Metalla et eorum	Syrupi
Sales	Confectiones
Vegetabilia	Pulveres
Olea Expressa	Pilulæ
Olea Distillata	Præparata ex Ani-
Aquæ Distillatæ	malitus
Decocta	Emplastra
Infusa	Cerata
Mucilagines	Unguenta
Extracta	Linimenta
Misturæ	Cataplasma

Upon these divisions the limits to which we are confined prevent us from making more than a few observations.

Among the acids we perceive a form for the citric, now first introduced into the list, which will be found a useful and elegant medicine; we have a new form for the nitric, and the flores benzoës assume the name of acidum benzoicum.

In the alkalines we meet with no great difference, except in the change of names, which, for the most part, are shortened from those of the Edinburgh Pharmacopœia.

The same general observation may apply to the earths and salts, which, under the existing Pharmacopœia, form one common chapter with the two preceding divisions. The chapter sales employs the term soda instead of that of natron.

The sulphurea of the new Pharmacopœia is nearly a transcript of the preparata e sulphure of that hitherto in use.

Among the metallica we perceive the pulvis antimonialis ordered to be prepared with half the quantity of sulphurated antimony to that of gross antimony, as under the late form. A useful and well-known preparation of arsenic is introduced under the name of liquor arsenicalis. Copper furnishes two preparations, cuprum ammoniatum and liquor cupri ammoniati; and iron several additional forms.

Among the distilled waters, the aqua anethi is banished, and the aqua carui introduced in its stead.

The addition to the chapter of decoctions is numerous, and consists chiefly in a form of this kind for the dulcamara, lichen, senega, and veratrum.

To the infusions there is also a very numerous addition: angustura, cloves, cascarrilla, cinchona, columbo, quassia, rhubarb, simarouba, tobacco, digitalis, horse-radish, each be-

comes a separate subject of this mode of preparation.

Among the mucilages, that of tragacanth is omitted.

The extracts afford us new preparations in the hop (*humulus lupulus*), poppy, sarsaparilla, dandelion (*taraxacum*), and hemlock.

The mixtures give us a new form for gum guaiacum.

The spirits revive the old *spiritus anisi*, and *spiritus raphani*, the latter under the newer name of *spiritus armoracæ compositus*.

The chapter of tinctures provides a new form for capsicum, digitalis, humulus, hyoscyamus, kino.

The acetæ give us a form for the colchicum.

The syrups provide a form for the lemon, and order the *syrupus papaveris somniferi* to be prepared from its extract.

The term *confectiones* is intended to embrace equally electuaries, confections, and conserves: from this chapter several of the existing forms are banished.

The list of *pulveres* is also considerably diminished, chiefly by a rejection of several of the cretaceous preparations.

Among the *pilulæ* we now meet with a gambooge pill; the opium pill is banished.

The list of *emplastra* is diminished in a few forms, and enriched by about an equal number.

The *cerata* are increased by a *ceratum sabinæ* and *C. lyttæ*.

The *unguenta* are much diminished; several of those, indeed, in the existing Pharmacopœia being transferred under a different preparation to the chapter of *cerata*: while as new articles we have an *U. hydrargyri nitrici*, *U. hydrargyri nitrico-oxydati*, and *U. veratri*.

The *liniments* give us a new preparation, a *lin. æruginis*.

The *cataplasms* offer us a new form for one prepared from meal and yeast, under the title of *C. fermenti*.

PHARMACOPOLIST. *s.* (φαρμακων πολωτης.) An apothecary; one who sells medicines.

PHARMACY. The genuine science of therapeutics may be divided into three parts: medicinal materials, the preparation of those materials, and the diseases in which they are employed. Pharmacy includes the second of these divisions; and is, hence, the doctrine of preserving, arranging, compounding, and intermixing the different articles of the *materia medica*, so that as simple substances we may obtain their virtues in the most active or most convenient form, and, in a state of combination, redouble or vary their powers according to the intention we have in view. In prosecuting this subject a multiplicity of operations are necessary, some of them mechanical, some chemical, which constitute the means by which the result is to be attained; and under this natural division the means and the end, pharmaceutical operations, and pharmaceutical preparations, we shall consider the subject before us: availing ourselves to a considerable extent of an article upon the same subject furnished by the editor of this department of the *PAN-TOLOGIA* to another respectable dictionary of arts and sciences a few years ago, but availing ourselves

of the various important discoveries which have since taken place in several branches of chemistry, so far as they are connected with the present subject, and re-modelling it as far as is necessary in reference to the new Pharmacopœia of the London college, which had not then made its appearance.

PART I.—PHARMACEUTICAL OPERATIONS.

Under this head we shall comprise the mode of collecting and preserving medicinal simples: the mechanical instruments employed, and the changes they introduce: chemical instruments and apparatus, their use, application, and power.

Collection and Preservation of Simples.

Each of the kingdoms of nature furnishes articles employed in medicine in their natural state, or when prepared by pharmacy; and in collecting these our first attention should be to make choice of sound and perfect substances; to throw off whatever is injured or decayed, and to separate them from all adventitious matters. As a general rule, they must be defended from the effects of moisture, great heat, cold, and freely exposed to the air. Yet where their activity and virtue depend on volatile principles, instead of being freely exposed to the air, they must be confined, as much as possible, from its contact.

The vegetable kingdom affords us the most numerous articles; these should rather be obtained from countries in which they grow naturally than countries in which they merely grow by transplantation; and those which grow wild, in dry soils, and exposed situations fully open to the air and the sun, are for the most part to be preferred to plants that are cultivated, or that grow in moist, low, shady, and confined situations. Annual roots should be collected before they shoot forth their stalks or flowers; biennial roots in the harvest of their first year, or the spring time of their second; perennial roots either in the spring time before the sap has begun to mount, or in harvest after it has returned. Worm-eaten or decayed roots, except in a few cases of resinous plants, are to be rejected; the rest are to be cleaned immediately with a brush and cold water; immersing them in the water as short a time as possible, and cutting off the radicles and fibres when not essential. Roots which consist chiefly of fibres, and have but a small sap, may be dried at once; if juicy and not aromatic, in a heat somewhat below 100° of Fahrenheit; but if aromatic, by simply exposing them to a current of cold dry air, and frequently turning them in it. If very thick and strong, they must be split and cut into slices and strung upon threads; if covered with a tough bark, they may be peeled and dried while fresh. Such as lose their virtues by drying are to be kept buried in dry sand.

It is difficult to lay down general rules for collecting stalks and leaves, some of which acquire, while others lose, their activity by age. Aromatics should be collected after the flower-buds are formed; non-aromatics, if annuals, when in flower or about to flower, biennials before they shoot; and perennials before they flower, especially the woody-fibred. They should be gathered in dry weather, after the morning dew is off, or before it falls in the evening. Generally speaking, they should be tied in bundles, and hung up in a shady, warm, and airy place, or spread upon the floor, and frequently turned. If very juicy, they are to be laid upon a sieve, and dried by a gentle degree of artificial warmth. Sprouts are to be collected before the buds open, and stalks to be gathered in autumn. Barks are to be collected when the most

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active part of the vegetables are concentrated in them. Spring is preferred for resinous barks, and autumn for the others which are rather gummy than resinous. Young trees afford the best bark for medical purposes.

The same rules direct the collection of woods; but they must not be taken from very young trees. Among the resinous woods, the heaviest, which sink in water, are selected. The albumen is to be rejected.

Flowers are collected in clear dry weather, before noon, but after the dew is off: either when they are just about to open, or immediately after they have opened. Of some the petals only are preserved, and the colourless claws are even cut away; of others whose calyx is odorous, the whole flower is kept. Flowers which are too small to be pulled singly, are dried with part of the stalk: these are called heads or tops.

Flowers are to be dried nearly as leaves, but more quickly, and with more attention. As they must not be exposed to the sun, it is best done by a slight degree of artificial warmth. When they lose their colour and smell they are unfit for use.

Seeds and fruits, unless when otherwise directed, are to be gathered when ripe, but before they fall spontaneously. Some pulpy fruits are freed from their core and seeds, strung upon thread, and dried artificially. They are in general best preserved in their natural coverings, although some, as the colocynth, are peeled, and others, as the tamarind, preserved fresh. Many of these are apt to spoil, or become rancid; and as they are then no longer fit for medical use, no very large quantity of them should be collected at a time.

The proper drying of vegetable substances is of the greatest importance. This is often directed to be done in the shade, and slowly, that the volatile and active particles may not be dissipated by too great heat; but this is an error, for they always lose infinitely more by slow than by quick drying. When, on account of the colour, they cannot be exposed to the sun, and the warmth of the atmosphere is insufficient, they should be dried by an artificial warmth, less than 100° Fahrenheit, and well exposed to a current of air. When perfectly dry and friable, they have little smell; but after being kept some time, they attract moisture from the air, and regain their proper odour.

The boxes and drawers in which vegetable matters are kept, should not impart to them any smell or taste; and more certainly to avoid this, they should be lined with paper. Such as are volatile, of a delicate texture, or subject to suffer from insects, must be kept in well covered glasses. Fruits and oily seeds, which are apt to become rancid, must be kept in a cool, and dry, but by no means in a warm or moist place.

Oily seeds, odorous plants, and those containing volatile principles, must be collected fresh every year. Others, whose properties are more permanent, and not subject to decay, will keep for several years. Vegetables collected in a moist and rainy season are in general more watery and apt to spoil. In a dry season, on the contrary, they contain more oily and resinous particles, and preserve much better.

Mechanical Operations.

These consist of the mode of determining the weight or measure of bodies; their division into minute particles; their separation of part from part, or of the useful from the useless; the modes of intermixing them.

Weights and Measures.—The quantities of sub-

stances employed as medicines are determined with the greatest accuracy by weighing. The scales should balance with the utmost precision, and turn with the utmost facility. Balances should be defended as much as possible from acid and other corrosive vapours, and not be unnecessarily suspended, as their delicacy of decision is hereby much impaired; and to guard against this last evil in another way, they should never be overloaded.

The want of an uniformity of weights and measures which is felt in every country, and in every branch of trade and commerce, is of peculiar inconvenience in pharmacy. All our college pharmacopœias command the use of troy weight; yet the wholesale druggists in every instance, excepting where a very small portion of an article is bought by grains, simples, or drams, sell by avoirdupois weight; and there is reason to fear that, both amongst apothecaries and druggists, most of the pharmaceutic compositions are prepared by this last division; in consequence of which it is impossible for the physician to know the exact strength of the dose he prescribes: and if he do, he cannot often obtain it in the proper proportions of its respective ingredients. The difficulty is still increased by a promiscuous use of weights and measures in determining the quantities of fluids; on which account, though the London college still authorises both for distinct purposes, the colleges of Edinburgh and Dublin have rejected measures altogether.

For measuring fluids, the graduated glass measures are always to be preferred: they should be of different sizes, according to the quantities they are intended to measure. Elastic fluids are also measured in glass tubes, graduated by inches and their decimals.

Specific gravity is the weight of a determinate bulk of any body. For a standard of comparison, distilled water has been assumed as unity. The specific gravity of solids is ascertained, by comparing the weight of the body in the air with its weight when suspended in water. The quotient obtained by dividing its weight in air, by the difference between its weight in air and its weight in water, is its specific gravity. The specific gravity of fluids may be ascertained by comparing the loss of weight of a solid body, such as a piece of crystal, when immersed in distilled water, with its loss when immersed in the fluid we wish to examine; by dividing its loss of weight in the fluid by its loss of weight in the water, the quotient is the specific gravity of the fluid: or a small phial, containing a known weight of distilled water, may be filled with the fluid to be examined and weighed, and by dividing the weight of the fluid by the weight of the water, the specific gravity is ascertained.

Although these are the only general principles by which specific gravities are ascertained, yet as the result is always influenced by the state of the thermometer and barometer at the time of the experiments, and as the manipulation is a work of great nicety, various ingenious instruments have been contrived to render the process and calculation easy. Of all these, the gravimeter of Morveau seems to deserve the preference.

It would be of material consequence to science and the arts, if specific gravities were always indicated by the numerical term expressing their relation to the specific gravity of distilled water. This however is unfortunately not the case. The excise-officers in this country collect the duties paid by spirituous liquors, by estimating the proportion which they contain of a standard spirit, about 0.935

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in specific gravity, which they call hydrometer proof, and they express the relation which spirits of a different strength have to the standard spirit by saying that they are above or under hydrometer proof. Thus one to six, or one in seven below hydrometer proof means that it is equal in strength to a mixture of six parts of proof spirit with one of water.

The only other mode of expressing specific gravities, which it is necessary to notice, is that of Baumé's aerometer, as it is often used in the writings of the French chemists, and is little understood in this country. For substances heavier than water he assumes the specific gravity of distilled water as zero, and graduates the stem of his instrument downwards, each degree being supposed by him to express the number of parts of muriat of soda contained in a given solution, which however is not at all the case. For substances lighter than water the tube is graduated upwards, and this zero is afforded by a solution of 10 of salt in 90 water.

Mechanical division.—By this process substances are reduced to a form better adapted for medical purposes; and by the increase of their surface, their action is promoted, both as medical and chemical agents. It is performed by cutting, bruising, grinding, grating, rasping, filing, pulverization, trituration, and granulation, by means of machinery or of proper instruments.

Pulverization is the first of these operations that is commonly employed in the apothecary's shop. It is performed by means of pestles and mortars. The bottom of the mortars should be concave; and their sides should neither be so inclined as not to allow the substances operated on to fall to the bottom between each stroke of the pestle, nor so perpendicular as to collect it too much together, and to retard the operation. The materials of which the pestles and mortars are formed should resist both the mechanical and chemical action of the substances for which they are used. Wood, iron, marble, siliceous stones, porcelain, and glass, are all employed; but copper, and metals containing copper, are to be avoided. They should be provided with covers, to prevent the finest and lightest parts from escaping, and to defend the operator from the effects of disagreeable or noxious substances. But these ends are more completely attained, by tying a piece of pliable leather round the pestle and round the mouth of the mortar. It must be closely applied, and at the same time so large, as to permit the free motion of the pestle. In some instances, it will be even necessary for the operator to cover his mouth and nostrils with a wet cloth, and to stand with his back to a current of air, that the very acrid particles which arise may be carried from him. The addition of a little water or spirit of wine, or of a few almonds, to very light and dry substances, will prevent their flying off. But almonds are apt to induce rancidity, and powders are always injured by the drying which is necessary when they have been moistened. Water must never be added to substances which absorb it, or are rendered cohesive by it.

All vegetable substances must be previously dried. Resins and gummy resins, which become soft in summer, must be powdered in very cold weather, and must be beaten gently, or they will be converted into a paste instead of being powdered. Wood, roots, barks, horn, bone, ivory, &c. must be previously cut, split, chipped, or rasped. Fibrous woods and roots should be finely shaved after their bark is removed, for otherwise their powders will be full of hair-like filaments, which

can scarcely be separated. Some substances will even require to be moistened with mucilage of tragacanth, or of starch, and then dried before they can be powdered. Camphor may be conveniently powdered by the addition of a little spirit of wine, or almond oil. The emulsive seeds cannot be reduced to powder, unless some dry powder be added to them. To aromatic oily substances, sugar is the best addition. All impurities and inert parts having been previously separated, the operation must be continued and repeated upon vegetable substances, till no residuum is left. The powders obtained at different times must then be intimately mixed together, so as to bring the whole to a state of perfect uniformity.

Very hard stony substances must be repeatedly heated to a red heat, and then suddenly quenched in cold water, until they become sufficiently friable. Some metals may be powdered hot in a heated iron mortar, or may be rendered brittle by alloying them with a little mercury.

Trituration is intended for the still more minute division of bodies. It is performed in flat mortars of glass, agate, or other hard materials, by giving a rotatory motion to the pestle; or on a levigating stone, which is generally of porphyry, by means of a muller of the same substance. On large quantities it is performed by rollers of hard stone, turning horizontally upon each other, or by one vertical roller twining on a flat stone.

The substances subjected to this operation are generally previously powdered or ground.

Levigation differs from trituration only in the addition of water or spirit of wine to the powder operated upon, so as to form the whole mass into a kind of paste, which is rubbed until it be of sufficient smoothness or fineness. Earths, and some metallic substances, are levigated.

Granulation is employed for the mechanical division of some metals. It is performed either by stirring the melted metal with an iron rod until it cools, or by pouring it into water, and stirring it continually as before, or by pouring it into a covered box, previously well rubbed with chalk, and shaking it until the metal cools, when the rolling motion will be converted into a rattling one. The adhering chalk is then to be washed away.

Mechanical separation is obtained by sifting, elutriation, decantation, filtration, despumation, expression.

Sifting. From dry substances, which are reduced to the due degree of minuteness, the coarser particles are to be separated by sieves of iron-ware, hair-cloth or gauze, or by being dusted through bags of fine linen. For very light and valuable powders, or acrid substances, compound sieves, having a close lid and receiver, must be used. The particles which are not of sufficient fineness to pass through the interstices of the sieve may be again powdered.

Elutriation is confined to mineral substances, on which water has no action. It is performed for separating them from foreign particles and impurities, of a different specific gravity, in which case they are said to be washed; or for separating the impalpable powders, obtained by trituration and levigation from the coarser particles. This process depends upon the property that very fine or light powders have of remaining for some time suspended in water; and is performed by diffusing the powder or paste formed by levigation through plenty of water, letting it stand a sufficient time, until the coarser particles settle at the bottom; and then pouring off the liquid in which the finer or lighter particles are suspended. Fresh water may

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be poured on the residuum, and the operation repeated; or the coarser particles, which fall to the bottom, may be previously levigated a second time.

Decantation. The fine powder which is washed over with the water is separated from it, by allowing it to subside completely, and by either decanting off the water very carefully, or by drawing it off by a syringe or syphon. These processes are very frequently made use of for separating fluids from solids which are specifically heavier, especially when the quantity is very large, or the solid so subtle as to pass through the pores of most substances employed for filtration, or the liquid so acrid as to corrode them.

Filtration. For the same purpose of separating fluids from solids, straining and filtration are often used. These differ only in degree, and are employed when the powder either does not subside at all, or too slowly and imperfectly for decantation. The instruments for this purpose are of various materials, and must in no instance be acted upon by the substances for which they are employed. Fats, resins, wax, and oils, are strained through hemp or flax spread evenly over a piece of wire-cloth or net stretched in a frame. For saccharine and mucilaginous liquors, fine flannel may be used; for some saline solutions, linen. Where these are not fine enough, unsized paper is employed, but it is extremely apt to burst by hot watery liquors which dissolve its size; and very acrid liquors, such as acids, are filtered by means of a glass-funnel, filled with powdered quartz, a few of the larger pieces being put in the neck, smaller pieces over these, and the finer powder placed over all. The porosity of this last filter retains much of the liquor; but it may be recovered by gently pouring on it as much distilled water; the liquor will then pass through, and the water be retained in its place. Water may be filtered in large quantities through basins of porous stone, or artificial basins of nearly equal parts of fine clay and coarse sand. The size of the filters depends on the quantity of matter to be strained. When large, the flannel or linen is formed into a conical bag, and suspended from a hoop or frame; the paper is either spread on the inside of these bags, or folded into a conical form, and suspended by a funnel. It is of advantage to introduce glass rods or quill-barrels between the paper and funnel, to prevent them from adhering too closely. What passes first is seldom fine enough, and must be poured back again, until by the swelling of the fibres of the filter, or filling up of its pores, the fluid acquires the requisite degree of limpidity. The filter is sometimes covered with charcoal powder, which is a useful addition to muddy and deep-coloured liquors. The filtration of some viscid substances is much assisted by heat.

Expression is a species of filtration, assisted by mechanical force. It is principally employed to obtain the juices of fresh vegetables, and the unctuous vegetable oils. It is performed by means of a screw press with plates of wood, iron, or tin. The subject of the operation is previously beaten, ground, or bruised. It is then inclosed in a bag, which must not be too much filled, and introduced between the plates of the press. The bags should be of hair-cloth, or canvass inclosed in hair-cloth. Hempen and woollen bags are apt to give vegetable juices a disagreeable taste. The pressure should be gentle at first, and increased gradually. Vegetables intended for this operation should be perfectly fresh and freed from all impurities. In general they should be expressed as soon as they are bruised,

for it disposes them to ferment; but subacid fruits give a larger quantity of juice and of finer quality, when they are allowed to stand some days in a wooden or earthen vessel after they are bruised. To some vegetables which are not juicy enough of themselves, the addition of a little water is necessary. Lemons and oranges must be peeled, as their skins contain a great deal of essential oil, which would mix with the juice. The oil itself may be obtained separately, by expression with the fingers against a plate of glass.

For unctuous seeds iron-plates are used; and it is customary not only to heat the plates, but to warm the bruised seeds in a kettle over the fire, after they have been sprinkled with some water, as by these means the product is increased, and the oil obtained is more limpid. But as their disposition to rancidity is increased by it, if possible this practice should be laid aside, or confined to exposing the bruised seeds, inclosed in a bag, to the steam of hot water.

Despumation is generally practised on thick and clammy liquors, which contain much slimy and other impurities, not easily separable by filtration.

The scum arises either by simply heating the liquor, or by clarifying it, which is done by mixing with the liquor, when cold, whites of eggs well beaten with a little water, which on being heated coagulates, and entangling the impurities of the liquor, rises with them to the surface, and may be easily removed by a perforated ladle. Or the liquor may now be filtered with ease. Spirituous liquors are clarified by means of isinglass dissolved in water, or any albuminous fluid, such as milk, which coagulates by the action of alcohol without the assistance of heat. Some expressed juices, such as those of the antiscorbutic plants, are instantly clarified by the addition of vegetable acid, such as the juice of bitter oranges.

Fluids can only be separated from each other, when they have no tendency to combine, and when they differ in specific gravity. The separation may be effected by skimming off the lighter fluid with a silver or glass spoon; or by drawing it off by a syringe or syphon; or by means of a glass separatory, which is an instrument having a projecting tube, terminating in a very slender point, through which the heavier fluid alone is permitted to run; or by means of the capillary attraction of a spongy woollen thread; for no fluid will enter a substance whose pores are filled by another, for which it has no attraction; and, lastly, upon the same principle, by means of a filter of unsized paper, previously soaked in one of the fluids, which in this way readily passes through it, while the other remains behind.

Mechanical mixture is performed by agitation, trituration, or kneading; but these will be best considered in treating of the forms in which medicines are exhibited.

Chemical Operations and Results.

Under this chapter we have to consider the apparatus employed, the changes produced, and the general analyses that ensue.

The apparatus consists of vessels, fuel, or heat; and the different modes by which such fuel or heat is applied, whether lamps, furnaces, &c.

The vessels must necessarily vary in their form and materials; upon the first of which it will be more convenient to enlarge as we proceed to treat of the particular operations in which they are employed. In choosing the materials for the construction of our vessels, the properties most generally

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required are a power of resisting chemical agents' transparency, compactness, strength, fixity and infusibility, and an ability to sustain sudden variations of temperature without breaking.

Generally speaking, metals possess the four last properties in considerable perfection; but they are all opaque. Iron and copper are apt to be corroded by chemical agents; and a solution of the last is often followed by dangerous affections. Tinning them will sometimes, but not always, answer; for tin and lead are often too fusible. Platinum, gold, and silver, resist most of the chemical agents, but are too expensive for general use.

Good earthen ware resists the greatest intensity of heat, but has no other property to recommend it. Clay, the basis of all such wares, is plastic when worked with water, and sufficiently hard when burnt with an intense heat. But intense heat contracts it unduly; and it is apt to split and crack upon exposure to sudden changes of temperature; whence it is necessary to counteract this property by the addition of some other substance. Siliceous sand, clay reduced to powder, and then burnt with a very intense heat, and plumbago, are occasionally used. These additions, however, are attended with other inconveniences; plumbago especially is liable to combustion, and sand diminishes the compactness; so that when not glazed, they are porous, and when glazed, they are acted upon by chemical agents. The chemical vessels, manufactured by Messrs. Wedgwood, are the best of this description, except porcelain, which is too expensive.

Glass possesses the three first qualities in an eminent degree, and may be heated red-hot without melting. Its greatest inconvenience is its disposition to crack or break in pieces when suddenly heated or cooled. As this is occasioned by its unequal expansion or contraction, it is best remedied by forming the vessels very thin, and giving them in general a rounded shape. Glass-vessels should also be well annealed, that is, cooled very slowly, after being blown, by placing them immediately in an oven while they are yet in a soft state. When ill annealed, or cooled suddenly, glass is apt to fly in pieces on the slightest change of temperature, or touch of a sharp point. We may sometimes take advantage of this imperfection; for by means of a red-hot wire, glass-vessels may be cut into any shape. Where there is not a crack already in the glass, the point of the wire is applied near the edge, by which a crack is formed; and this is afterwards easily led in any direction we wish.

Reaumur's porcelain is also glass, which by being surrounded with hot sand, is made to cool so slowly, that it assumes a crystalline texture, that destroys its transparency, but imparts to it every other quality desirable in chemical vessels. The coarser kinds of glass are commonly used in making it; but as there is no manufacture of this valuable substance, its employment is still very limited.

Lutes also form a necessary part of chemical apparatus. They are compositions of various substances, intended to close the joining of vessels, to coat glass vessels, and to line furnaces. Lutes of the first description are commonly employed to confine elastic vapours. They should therefore possess the following properties, viscosity, plasticity, compactness, the power of resisting acrid vapours, and certain degrees of heat. The viscosity of lutes depends on the presence either of unctuous or resinous substances, mucilaginous substances, or clay.

Lutes of the first kind possess viscosity and resist acrid vapours in an eminent degree; but they

are in general so fusible that they cannot be employed when they are exposed even to very low degrees of heat, and they will not adhere to any substance that is at all moist. The following are a few of this kind that have been most frequently employed.

Eight parts of yellow wax melted with one of oil of turpentine, with or without the addition of resinous substances, according to the degree of pliability and consistence required. Lavoisier's lute.

Four parts of wax melted with two of varnish and one of olive oil. Saussure's lute.

Three parts of powdered clay worked up into a paste, with one of drying oil, or, what is better, amber varnish. The drying oil is prepared by boiling 22.5 parts of litharge in 16 of linseed oil until it be dissolved. Fat lute.

Chalk and oil, or glazier's-putty, is well fitted for luting tubes permanently into glass vessels, for it becomes so hard that it cannot be easily removed.

Equal parts of litharge, quicklime, and powdered clay, worked into a paste with oil varnish, is sometimes used to daub the cracks in glass vessels, so as to render them again fit for some purposes.

Melted pitch and brick dust.

Mucilaginous substances, such as flour, starch, gum, and glue mixed with water, with or without some powder, are sufficiently adhesive, are dried by moderate degrees of heat, and are easily removed after the operation, by moistening them with water. But a high temperature destroys them, and they do not resist corrosive vapours. Of these take the following forms.

Slips of bladder macerated in water, and applied with the inside next the vessels. They are apt, however, from their great contraction on drying, to break weak vessels.

One part of gum arabic with six or eight of chalk, formed into a paste with water.

Flour worked into a paste with powdered clay or chalk.

Almond or linseed meal formed into a paste with mucilage or water.

Quicklime in fine powder, hastily mixed with white of egg, and instantly applied, sets very quickly, but becomes so hard that it can scarcely be removed.

Slaked lime in fine powder, with glue, does not set so quickly as the former.

The cracks of glass vessels are sometimes mended by daubing them and a suitable piece of linen over with white of egg, strewing both over with finely powdered quicklime, and instantly applying the linen closely and evenly.

Earthy lutes resist very high temperatures, but they become so hard that they can scarcely be removed, and often harden so quickly after they are mixed up, that they must be applied immediately. Examples.

Quicklime well incorporated with a sixth part of muriate of soda.

Burnt gypsum, made up with water.

One ounce of borax dissolved in a pound of boiling water, mixed with a sufficient quantity of powdered clay. Mr. Watt's fire lute.

One part of clay with four of sand formed into a paste with water. This is also used for coating glass vessels, in order to render them stronger and capable of resisting violent degrees of heat. It is then made into a very thin mass, and applied in successive layers, taking care that each coat be perfectly dry before another be laid on.

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The lutes for lining furnaces will be described when treating of furnaces.

The junctures of vessels which are to be luted to each other must previously be accurately and firmly fitted, by introducing between them, when necessary, shorts bits of wood or cork, or, if the disproportion be very great, by means of a cork fitted to the one vessel, having a circular hole bored through it, through which the neck of the other vessel or tube passes. After being thus fitted, the lute is either applied very thin, by spreading it on slips of linen or paper, and securing it with thread, or if it is a paste lute, it is formed into small cylinders, which are successively applied to the junctures, taking care that each piece be made to adhere firmly and perfectly close in every part before another is put on. Lastly, the whole is secured by slips of linen or bladder. In many cases, to permit the escape of elastic vapours, a small hole is made through the lute with a pin, or the lute is perforated by a small quill fitted with a stopper.

Heat and Fuel.—As caloric is an agent of the most extensive utility in the chemical operations of pharmacy, it is necessary that we should be acquainted with the means of employing it in the most economical and efficient manner.

The rays of the sun are used in the drying of many vegetable substances, and the only attentions necessary are to expose as large a surface as possible, and to turn them frequently, that every part may be dried alike. They are also sometimes used for promoting spontaneous evaporation.

The combustion of different substances is a much more powerful and certain source of heat. The substances employed for this purpose are either fluid or solid. Alcohol, oil, tallow, wood, turf, coal, charcoal, and coke, are all occasionally employed.

Alcohol, oil, and melted tallow, fluid inflammables, must be burnt on porous wicks. These act merely mechanically, by drawing up a portion of the fluid to be volatilized and inflamed. They are therefore burnt in lamps of various constructions. But although commonly used to produce light, they afford a very uniform, though not very high, temperature. It may however be increased by increasing the number of the wicks and their size. Alcohol produces a steady heat, no soot, and, if strong, leaves no residuum. Oil gives a higher temperature, but on a common wick produces much smoke and soot. These are diminished, and the light and heat increased, by making the surface of the flame bear a large proportion to the centre, which is best done by a cylindrical wick, so contrived that the air has free access both to the outside and to the inside of the cylinder, as in Argand's lamp, invented by Mr. Boulton of Birmingham. In this way oil may be made to produce a considerable temperature of great uniformity, and without the inconvenience of smoke.

Wicks have the inconvenience of being charred by the high temperature to which they are subjected, and of becoming so clogged as to prevent the fluid from rising in them. They must then be trimmed, but this is seldomer necessary with alcohol and fine oils than with the coarser oils. Lamps are also improved by adding a chimney to them. It must admit the free access of air to the flame, and then it increases the current, confines the heat, and steadies the flame. The intensity of the temperature of flame may be increased astonishingly by forcing a small current of hot air through it as by the blow pipe.

Wood, turf, coal, charcoal, and coke, solid combustibles, are burnt in grates and furnaces. Wood has the advantage of kindling readily, but affords a very unsteady temperature, is inconvenient from its flame, smoke, and soot, and requires much attention. The heavy and dense woods give the greatest heat, burn longest, and leave a dense charcoal.

Dry turf gives a steady heat, and does not require so much attention as wood; but it consumes fast, its smoke is copious and penetrating, and the empyreumatic smell which it imparts to every thing it comes in contact with adheres with great obstinacy. The heavy turf of marshes is preferable to the light superficial turf.

Coal is the fuel most commonly used in this country. Its heat is considerable and sufficiently permanent, but it produces much flame and smoke.

Charcoal, especially of the dense woods, is a very convenient and excellent fuel. It burns without flame or smoke, and gives a strong, uniform, and permanent heat, which may be easily regulated, especially when it is not in too large pieces, and is a little damp. But it is costly, and burns quickly.

Coke, or charred coal, possesses similar properties to charcoal; it is less easily kindled, but is capable of producing a higher temperature, and burns more slowly.

When an open grate is used for chemical purposes, it should be provided with cranes to support the vessels operated in, that they may not be overturned by the burning away of the fuel.

Furnaces.—In all these, the principal objects are, to produce a sufficient degree of heat, with little consumption of fuel, and to be able to regulate the degree of heat.

An unnecessary expenditure of fuel is prevented by forming the sides of the furnace of very imperfect conductors of caloric, and by constructing it so that the subject operated on may be exposed to the full action of the fire.

The degree of heat is regulated by the quantity of air which comes in contact with the burning fuel. The quantity of air is in the compound ratio of the size of the aperture through which it enters and its velocity. The velocity is increased by mechanical means, as by bellows, or by increasing the height and width of the chimney.

The size and form of furnaces, and the materials of which they are constructed, are various, according to the purposes for which they are intended.

The essential parts of a furnace are, a body for the fuel to burn in; a grate for it to burn upon; an ash-pit to admit air and receive the ashes; a chimney for carrying off the smoke and vapours.

The ash-pit should be perfectly close, and furnished with a door and register-plate, to regulate the quantity of air admitted.

The bars of the grate should be triangular, and placed with an angle pointed downwards, and not above half an inch distant. The grate should be fixed on the outside of the body.

The body may be cylindrical or elliptical, and it must have apertures for introducing the fuel and the subjects of the operation, and for conveying away the smoke and vapours.

When the combustion is supported by the current of air naturally excited by the burning of the fuel, it is called a wind-furnace; when it is accelerated by increasing the velocity of the current by bellows, it forms a blast-furnace; and when the

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body of the furnace is covered with a dome, which terminates in the chimney, it constitutes a reverberatory furnace.

Furnaces are either fixed, and built of fire-brick, or portable, and fabricated of plate iron. When of iron, they must be lined with some badly conducting and refractory substance, both to prevent the dissipation of heat, and to defend the iron against the action of the fire. A mixture of scales of iron and powdered tiles worked up with blood, hair, and clay, is much recommended; and professor Hagen says, that it is less apt to split and crack when exposed at once to a violent heat, than when dried gradually, according to the common directions. Dr. Black employed two different coatings. Next to the iron he applied a composition of three parts by weight of charcoal, and one of fine clay. These are first mixed in the state of fine powder, and then worked up with as much water as will permit the mass to be formed into balls, which are applied to the sides of the furnace, and beat very firm and compact with the face of a broad hammer, to the thickness of about one inch and a half in general, but so as to give an elliptical form to the cavity. Over this, another lute, composed of six or seven parts of sand, and one of clay, is to be applied in the same manner, to the thickness of about half an inch. These lutes must be allowed to become perfectly dry before the furnace is heated, which should at first be done gradually. They may also be lined with fire bricks of a proper form, accurately fitted and well cemented together before the top plate is screwed on.

The general fault of furnaces is that they admit too much air, which prevents us from regulating the temperature. It either becomes too violent and unmanageable, or when more cold air is admitted than what is necessary for supporting the combustion, it carries off heat, and prevents us from raising the temperature as high as we otherwise would. The superior merit of Dr. Black's furnace consists in the facility with which the admission of air is regulated; and every attempt hitherto made to improve it by increasing the number of its apertures have in reality injured it.

Heat may be applied to vessels employed in chemical operations, directly, as in the open fire and reverberatory furnace. Or through the medium of sand; the sand-bath. Of water; the water-bath. Of steam; the vapour-bath. Of air, as in the muffle.

Changes produced by Chemical Processes.—These consist chiefly in a new mode of aggregation, combination, and decomposition.

The form of aggregation may be altered by fusion, vaporization, condensation, congelation, and coagulation.

Fusion is the conversion of a solid into a liquid by the sole agency of caloric. Substances differ very much in the degrees of their fusibility; some, as water and mercury, existing as fluids in the ordinary temperatures of the atmosphere; while others, as the pure earths, cannot be melted by any heat we can produce.

Liquefaction is commonly employed to express the melting of substances, as tallow, wax, resin, &c. which pass through intermediate states of softness before they become fluid. Fusion is the melting of substances which pass immediately from the solid to the fluid state, as the salts and metals, except iron and platinum.

When, in consequence of fusion, the substances operated on acquire a greater or less degree of transparency, a dense uniform texture, and great

brittleness, and exhibit a conchoidal fracture, with a specular surface, and the edges of the fragments very sharp, it is termed vitrification.

In general, simple substances are less fusible than compounds; for example, the simple earths cannot be melted singly, but when mixed are easily fused. The additions which are some times made to refractory substances to promote their fusion are termed fluxes: which fluxes are generally saline bodies.

Thus the alkalis potass and soda promote powerfully the fusion of siliceous stones; but they are only used for accurate experiments. The white-flux is a mixture of a little potass with carbonate of potass, and is prepared by deflagrating together equal parts of nitrate of potass and super-tartrate of potass. When an oxyd is at the same time to be reduced, the black flux is preferred, which is produced by the deflagration of two parts of super-tartrate of potass, and one of nitrate of potass. It differs from the former only in containing a little charcoal. Soap promotes fusion by being converted by the fire into carbonate of soda and charcoal.

Aluminous stones have their fusion greatly promoted by the addition of sub-borate of soda.

Muriat of soda, the mixed phosphate of soda and ammonia, and other salts, are also occasionally employed for the same purpose.

An open fire is sufficient to melt some substances, others require the heat of a furnace.

The vessels in which fusion is performed must resist the heat necessary for the operation. In some instances, an iron or copper ladle or pot may be used, but most commonly crucibles are employed. These are of various sizes. The large crucibles are generally conical, with a small spout for the convenience of pouring out; the small ones are truncated triangular pyramids, and are commonly sold in nests.

The Hessian crucibles are composed of clay and sand, and when good will support an intense heat for many hours, without softening or melting; but they are disposed to crack when suddenly heated or cooled. This inconvenience may be on many occasions avoided, by using a double crucible, and filling up the interstice with sand, or by covering the crucible with a lute of clay and sand, by which means the heat is transmitted more gradually and equally. Those which ring clearly when struck, and are of an uniform thickness, and have a reddish brown colour, without black spots, are reckoned the best.

Wedgewood's crucibles are made of clay mixed with baked clay finely pounded, and are in every respect superior to the Hessian, but they are very expensive.

The black-lead crucibles, formed of clay and plumbago, are very durable, resist sudden changes of temperature, and may be repeatedly used, but they are destroyed when saline substances are melted in them, and suffer combustion when exposed red-hot to a current of air.

When placed in a furnace, crucibles should never be set upon the bars of the grate, but always upon a support. Dr. Kennedy found the hottest part of a furnace to be about an inch above the grate. They may be covered, to prevent the fuel or ashes from falling into them, with a lid of the same materials, or with another crucible inverted over them.

When the fusion is completed, the substance may be either permitted to cool in the crucible, or may be poured into a heated mould anointed with

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tallow, never with oil, or what is still better, covered with a thin coating of chalk, which is applied by laying it over with a mixture of chalk diffused in water, and then evaporating the water completely by heat. To prevent the crucible from being broken by cooling too rapidly, it is to be either replaced in the furnace, to cool gradually with it, or covered with some vessel to prevent its being exposed immediately to the air.

Fusion is performed with the intention of weakening the attraction of aggregation; or of separating substances of different degrees of fusibility from each other.

Vaporization is the conversion of a solid or fluid into vapour by the agency of caloric. Although vaporability be merely a relative term, substances are said to be permanently elastic, volatile, or fixed. The permanently elastic fluids or gasses are those which cannot be condensed into a fluid or solid form by any abstraction of caloric we are capable of producing. Fixed substances, on the contrary, are those which cannot be converted into vapour by great increase of temperature. The pressure of the atmosphere has very considerable effect in varying the degree at which substances are converted into vapour. Some solids, unless subjected to very great pressure, are at once converted into vapour, although most of them pass through the intermediate state of fluidity.

Vaporization is employed to separate substances differing in volatility: and to promote chemical action, by disaggregating them.

When employed with either of these views, no regard is paid to the substances volatilized, whether from solids, as in ustulation and charring; or from fluids, as in evaporation. Or whether the substances vaporized are condensed in proper vessels; for example, in a liquid form, as in distillation; or in a solid form, as in sublimation. Or whether the substances vaporized are permanently elastic, and are collected in their gaseous form, in a pneumatic apparatus.

Ustulation is almost entirely a metallurgical operation, and is employed to expel the sulphur and arsenic contained in some metallic ores. It is performed on small quantities in tests placed within a muffle. Tests are shallow vessels made of bone ashes or baked clay. Muffles are vessels of baked clay, of a semi-cylindrical form, the flat side forming the floor, and the arched portion the roof and sides. The end and sides are perforated with holes for the free transmission of air, and the open extremity is placed at the door of the furnace, for the inspection and manipulation of the process. The reverberatory furnace is commonly employed for roasting, and the heat is at first very gentle, and slowly raised to redness. It is accelerated by exposing as large a surface of the substance to be roasted as possible, and by stirring it frequently, so as to prevent any agglutination, and to bring every part in succession to the surface.

Charring may be performed on any of the compound oxyds, by subjecting them to a degree of heat sufficient to expel all their hydrogen, nitrogen, and superabundant oxygen, while the carbon, being a fixed principle, remains behind in the state of charcoal. The temperature necessary for the operation may be produced either by the combustion of other substances, or by the partial combustion of the substance to be charred. In the former case, the operation may be performed in any vessel which excludes the access of air, while it permits the escape of the vapours formed. In the latter, the access of air must be regulated in such a man-

ner, that it may be suppressed whenever the combustion has reached the requisite degree: for if continued to be admitted, the charcoal itself would be dissipated in the form of carbonic acid gas, and nothing would remain but the alkaline and earthy matter, which these substances always contain. When combustion is carried this length, the process is termed incineration. The vapours which arise in the operation of charring are sometimes condensed, as in the manufacture of tar.

Evaporation is the conversion of a fluid into vapour, by its combination with caloric. In this process, the atmosphere is not a necessary agent, but rather a hindrance, by its pressure. This forms a criterion between chemical evaporation and spontaneous evaporation, which is merely the solution of a fluid in air.

It is performed in open, shallow, or hemispherical vessels of silver, tinned copper or iron, earthen-ware or glass. The necessary caloric may be furnished by means of an open fire, a lamp, or a furnace, either immediately, or with the intervention of sand, water, or vapour. The degree of heat must be regulated by the nature of the substance operated on. In general, it should not be greater than what is absolutely necessary.

Evaporation may be partial: producing from saline fluids, concentration; and from viscid fluids, inspissation: or it may be total, and produce exsiccation.

Concentration is employed to lessen the quantity of diluting fluids, which is called dephlegmation: or as a preliminary step to crystallization.

Insipissation is almost confined to animal and vegetable substances; and as these are apt to be partially decomposed by heat, or to become empyreumatic, it should always be performed, especially towards the end of the process, in a water or vapour bath.

Exsiccation is here taken in a very limited sense; for the term is also with propriety used to express the drying of vegetables by a gentle heat, the efflorescence of salts, and the abstraction of moisture from mixtures of insoluble powders with water, by means of chalk-stones or powdered chalk pressed into a smooth mass. At present, we limit its meaning to the total expulsion of moisture from any body by means of caloric.

The exsiccation of compound oxyds should always be performed in the water bath.

Salts are deprived of their water of crystallization by exposing them to the action of heat in a glass vessel or iron ladle. Sometimes they first dissolve in their water of crystallization, or undergo what is called the watery fusion, and are afterwards converted into a dry mass by its total expulsion; as in the calcination of borax or burning of alum.

When exsiccation is attended with a crackling noise, and splitting of the salt, as in muriate of soda, it is termed decrepitation, and is performed by throwing into a heated iron vessel small quantities of the salt at a time, covering it up, and waiting until the decrepitation be over, before a fresh quantity is thrown in.

Exsiccation is performed on saline bodies, to render them more acrid or pulverulent, or to prepare them for chemical operations. Animal and vegetable substances are exsiccated to give them a solid form, and to prevent their fermentation.

Condensation is the reverse of expansion, and is produced either by mechanical pressure forcing out the caloric in a sensible form, as water is squeezed out of a sponge, or by the chemical ab-

traction of caloric, which is followed by an approximation of the particles of the substance.

This latter kind alone is the object of our investigation at present. In this way we may be supposed to condense substances existing naturally as gases or vapours; or substances naturally solid or fluid, converted into vapours by adventitious circumstances.

The former instance is almost supposititious: for we are not able, by any diminution of temperature, to reduce the permanently elastic fluids to a fluid or solid state.

The latter instance is always preceded by vaporization, and comprehends those operations in which the substances vaporized are condensed in proper vessels.

When the product is a fluid, it is termed distillation; when solid, sublimation. Distillation is said to be performed, *viâ humidâ*, when fluids are the objects of the operation. *Viâ siccâ*, when solids are subjected to the operation, and the fluid product arises from decomposition, and a new arrangement of the constituent principles.

The objects of distillation are to separate more volatile fluids from less volatile fluids or solids: to promote the union of different substances: and to generate new products by the action of fire.

In all distillations, the heat applied should not be greater than what is necessary for the formation of the vapour, and even to this degree it should be gradually raised. The vessels also in which the distillation is performed should never be filled above one-half, and sometimes not above one-fourth, lest the substance contained in them should boil over.

As distillation is a combination of evaporation and condensation, the apparatus consists of two principal parts: the vessels in which the vapours are formed: and those in which they are condensed.

The vessels employed for both purposes are very various in their shapes, according to the manner in which the operation is conducted. The first difference depends on the direction of the vapour after its formation. It either descends, ascends, or passes off by the side; constituting a distillation *per descensum*, *per ascensum*, or *per latus*.

In the distillation *per descensum*, a perforated plate of tinned iron, or other materials, is fixed within any convenient vessel, so as to leave a space beneath it. On this the subject of the operation is laid, and over it is placed another plate, accurately closing the mouth of the vessel, and sufficiently strong to support the fuel. Thus the heat is applied from above, and the vapour is forced to descend into the inferior cavity, where it is condensed. In this way the oil of cloves is prepared, and on the same principles tar is manufactured, and mercury and zinc are separated from their ores.

In the distillation *per ascensum*, the vapour is allowed to arise to some height, and then is conveyed away to be condensed. The vessel most commonly employed for this purpose is the common copper still, which consists of a body for containing the materials, and a head into which the vapour ascends. From the middle of the head a tube rises for a short way, and is then reflected downwards, through which the steam passes to be condensed. Another kind of head, rising to a great height before it is reflected, is sometimes used for separating fluids, which differ little in volatility, as it was supposed that the less volatile vapours would be condensed and fall back into the still, while only the more volatile vapours would arise

to the top, so as to pass to the refrigeratory. The same object may be more conveniently attained by managing the fire with caution and address. The greater the surface exposed, and the less the height the vapours have to ascend, the more rapidly does the distillation proceed; and so well are these principles understood by the Scotch distillers, that they do not take more than three minutes to discharge a still containing gallons of fluid.

The condensing apparatus used with the common still is very simple. The tube in which the head terminates is inserted into the upper end of a pipe, which is kept cool by passing through a vessel filled with water, called the refrigeratory. This pipe is commonly made of a serpentine form; but as this renders it difficult to be cleaned, Dr. Black recommends a sigmoid pipe. The refrigeratory may be furnished with a stop-cock, that when the water it contains becomes too hot, and does not condense all the vapour produced, it may be changed for cold water. From the lower end of the pipe, the product of the distillation drops into the vessel destined to receive it; and we may observe, that when any vapour issues along with it, we should either diminish the power of the fire, or change the water in the refrigeratory. There was a process of this kind, called circulation. It consisted in arranging the apparatus, so that the vapours were no sooner condensed into a fluid form, than this fluid returned back into the distilling vessels, to be again vaporized; and was effected by distilling in a glass vessel, with so long a neck that the vapours were condensed before they escaped at the upper extremity, or by inverting one matrass within another.

When corrosive substances are distilled in this way, the cucurbit and alembic are used; but these substances are more conveniently distilled *per latus*.

The distillation *per latus* is performed in a retort, or pear-shaped vessel having the neck bent to one side. The body of a good retort is well rounded, uniform in its appearance, and of an equal thickness, and the neck is sufficiently bent to allow the vapours, when condensed, to run freely away, but not so much as to render the application of the receiver inconvenient, or to bring it too near the furnace. The passage from the body into the neck must be perfectly free and sufficiently wide, otherwise the vapours produced in the retort only circulate in its body, without passing over into the receiver. For introducing liquors into the retort without soiling its neck, which would injure the product, a bent funnel is necessary. It must be sufficiently long to introduce the liquor directly into the body of the retort; and in withdrawing it, we must carefully keep it applied to the upper part of the retort, that the drop hanging from it may not touch the inside of the neck. In some cases, where a mixture of different substances is to be distilled, it is convenient and necessary to have the whole apparatus properly adjusted before the mixture is made, and we must therefore employ a tubulated retort, or a retort furnished with an aperture, accurately closed with a ground stopper.

This tubulature should be placed on the upper convex part of the retort before it bends to form the neck, so that a fluid poured through it may fall directly into the body without soiling the neck.

Retorts are made of various materials. Flint glass is commonly used when the heat is not so great as to melt it. For distillations which require excessive degrees of heat, retorts of earthen-ware,

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or coated glass retorts, are employed. Quick-silver is distilled in iron retorts.

The simplest condensing apparatus used with the retort, is the common glass-receiver; which is a vessel of a conical or globular form, having a neck sufficiently wide to admit of the neck of the retort being introduced within it. To prevent the loss and dissipation of the vapours to be condensed, the retort and receiver may be accurately ground to each other, or secured by some proper lute. To prevent the receiver from being heated by the caloric evolved during the condensation of vapours in it, we must employ some means to keep it cool.

It is either immersed in cold water, or covered with snow, or pounded ice, or a constant evaporation is supported from its surface, by covering it with cloth, which is kept moist by means of the descent of water, from a vessel placed above it, through minute syphons or spongy worsted threads. But as, during the process of distillation, permanently elastic fluids are often produced, which would endanger the breaking of the vessels, these are permitted to escape either through a tubulature, or hole in the side of the receiver, or rather through a hole made in the luting. Receivers having a spout issuing from their side are used when we wish to keep separate the products obtained at different periods of any distillation. For condensing very volatile vapours, a series of receivers, communicating with each other, termed adopters, were formerly used; but these are now entirely superseded by Woulfe's apparatus, which consists of a tubulated retort, adapted to a tubulated receiver. With the tubulature of the receiver a three-necked bottle is connected by means of a bent tube, the further extremity of which is immersed, one or more inches, in some fluid contained in the bottle. A series of two or three similar bottles are connected with this first bottle in the same way. In the middle tubulature of each bottle a glass tube is fixed, having its lower extremity immersed about a quarter of an inch in the fluid. The height of the tube above the surface of the fluid must be greater than the sum of the columns of fluids standing over the further extremities of the connecting tubes, in all the bottles or vessels more remote from the retort. Tubes so adjusted are termed tubes of safety, for they prevent that reflux of fluid from the more remote into the nearer bottles, and into the receiver itself, which would otherwise inevitably happen, on any condensation of vapour taking place in the retort, receiver, or nearer bottles. Different contrivances for the same purpose have been described by Messrs. Welter and Burkitt; and a very ingenious mode of connecting the vessels without lute, has been invented by citizen Girard, but they would not be easily understood without plates. The further tubulature of the last bottle is commonly connected with a pneumatic apparatus, by means of a bent tube. When the whole is properly adjusted, air blown into the retort should pass through the receiver, rise in bubbles through the fluids contained in each of the bottles, and at last escape by the bent tube. In the receiver, those products of distillation are collected, which are condensable by cold alone. The first bottle is commonly filled with water, and the others with alkaline solutions, or other active fluids; and as the permanently elastic fluids produced are successively subjected to the action of all these, only those gasses will escape by the bent tube which are not absorbable by any of them.

In separating permanently elastic fluids or gasses from the substances in which they are found, we

are compelled to employ a distinct pneumatic apparatus; and the gass may then be received either into vessels absolutely empty, or filled with some fluid on which it exerts no action.

The first mode of collecting gasses may be practised by means of a bladder, moistened sufficiently to make it perfectly pliable, and then compressed so as to press out every particle of air from its cavity. In this state it may be easily filled with any gass. An oiled silk bag will answer the same purpose, and is more convenient in some respects, as it may be made of any size or form.

Glass or metallic vessels, such as balloons, may also be emptied for the purpose of receiving gasses, by fitting them with a stop-cock, and exhausting the air from them by means of an air-pump.

But the second mode of collecting gasses is the most convenient and common. In which case the vessels may be filled either with a fluid lighter, or heavier than the gass to be received into it.

The former method is seldom employed; but if we conduct a stream of any gass heavier than atmospheric air, such as carbonic acid gass, muriatic acid gass, &c. to the bottom of any vessel, it will gradually displace the air, and fill the vessel.

On the contrary, a gass lighter than atmospheric air, such as hydrogen, may be collected in an inverted vessel by conducting a stream of it to the top.

But gasses are most commonly collected by conducting the stream of gass into an inverted glass jar, or any other vessel filled with water or mercury. The gass ascends to the upper part of the vessel, and displaces the fluid. In this way gass may be kept a very long time, provided a small quantity of the fluid be left in the vessels, which prevents both the escape of the gass and the admission of atmospheric air.

The vessels may be of various shapes; but those most commonly employed are cylindrical. They may be either open only at one extremity, or furnished at the other with a stop-cock.

The manner of filling them with fluid is to immerse them completely in it, with the open extremity directed a little upwards, so that the whole air may escape from them, and then inverting them with their mouths downwards.

For filling them with convenience, a trough or cistern is commonly used. This should either be hollowed out of a solid block of wood or marble; or, if it be constructed of wood simply, be well painted or lined with lead or tinned copper. Its size may vary very much; but it must contain a sufficient depth of fluid to cover the largest transverse diameter of the vessels to be filled in it. At one end or side there should be a shelf for holding the vessels after they are filled. This shelf should be placed about an inch and a half below the surface of the fluid, and should be perforated with several holes, forming the apices of corresponding conical excavations, on the lower side, through which, as through inverted funnels, gaseous fluids may be more easily introduced into the vessels placed over them.

In general the vessels used with a mercurial apparatus should be stronger and smaller than those for a water cistern, and we must have a variety of glass and elastic tubes for conveying the gasses from the vessels in which they are formed to the funnels under the shelf.

The repeated distillation of any fluid is denominated rectification. When distillation renders the fluid stronger, or abstracts water from it, it is termed dephlegmation. When a fluid is distilled

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off from any substance, it is called abstraction: and if the product be redistilled from the same substance, or a fresh quantity of the same substance, it is denominated cohobation.

The difference between distillation and sublimation is only in the form of the product. When it is compact, it is termed a sublimate; when loose and spongy, it formerly had the appellation of flowers. Sublimation is sometimes performed in a crucible, and the vapours are condensed in a paper cone, or in another crucible inverted over it; sometimes in the lower part of a glass flask, cucurbit or phial, and the condensation is effected in the upper part or capital, and sometimes in a retort with a very short and wide neck, to which a conical receiver is fitted. The heat is most commonly applied through the medium of a sand-bath; and the degree of heat, and the depth to which the vessel is inserted in it, are regulated by the nature of the sublimation.

Congelation is the reduction of a fluid to a solid form, in consequence of the abstraction of caloric. The means employed for abstracting the caloric are the evaporation of volatile fluids, the solution of solids, and the contact of cold bodies.

Congelation is the conversion of a fluid into a solid of greater or less consistence, merely in consequence of a new arrangement of its particles, as during the process there is no separation of caloric or any other substance. The means of producing coagulation are increase of temperature, and the addition of certain substances, as acids and runners.

Chemical combination is the intimate union of the particles of at least two heterogeneous bodies. It is the effect resulting from the exertion of the attraction of affinity, and is therefore subjected to all the laws of affinity.

To produce the chemical union of any two or more bodies, it is necessary that they possess an affinity for each other; that their particles come into actual contact; that the strength of the affinity be greater than any counteracting causes which may be present.

The principal counteracting causes are, the attraction of aggregation, and affinities for other substances. The means to be employed for overcoming the action of other affinities will be treated of under Decomposition. The attraction of aggregation is overcome by means of mechanical division, or the action of caloric.

Combination is facilitated by increasing the points of actual contact, by the means of mechanical agitation: by condensation and compression. And the processes employed for producing combination may be considered with regard to the nature of the substances combined; and, to the nature of the compound produced. Gases combine with gases; and dissolve fluids or solids; or are absorbed by them. Fluids are dissolved in gases, or absorb them. They combine with fluids, and dissolve solids; or are rendered solid by them. Solids are solved in fluids and in gases; or absorb gases and solidify fluids.

The combination of gases with each other, in some instances, takes place when simply mixed together; thus nitrous and oxygen gases combine as soon as they come into contact; in other instances, it is necessary to elevate their temperature to a degree sufficient for their inflammation, either by means of the electric spark, or the contact of an ignited body, as in the combination of oxygen gas with hydrogen or nitrogen gas.

When gases combine with each other there is

always a considerable diminution of bulk, and not unfrequently they are condensed into a liquid or solid form. Hydrogen and oxygen gases form water; muriatic acid and ammonia gases form solid muriate of ammonia. But when the combination is effected by ignition, a violent expansion, which endangers the bursting of the vessels, previously takes place, in consequence of the increase of temperature.

Solution is the diminution of aggregation in any solid or fluid substance, in consequence of its entering into chemical combination. The substance, whether solid or fluid, whose aggregation is lessened, is termed the solvent; and the substance by whose agency the solution is effected is often called the menstruum or solvent.

Solution is said to be performed *vis humidâ*, when the natural form of the solvent is fluid; but when the agency of heat is necessary to give the solvent its fluid form, the solution is said to be performed *vis siccâ*.

The dissolving power of each menstruum is limited, and is determinate with regard to each solvent. The solubility of bodies is also limited and determinate with regard to each menstruum.

When any menstruum has dissolved the greatest possible quantity of any solvent, it is said to be saturated with it. But, in some cases, although saturated with one substance, it is still capable of dissolving others. Thus a saturated solution of muriat of soda will dissolve a certain quantity of nitrat of potass, and after that a portion of muriat of ammonia.

The dissolving power of solvents, and consequently the solubility of solvents, are generally increased by increase of temperature: and conversely, this power is diminished by diminution of temperature; so that, from a saturated solution, a separation of a portion of the solvent generally takes place on any reduction of temperature. This property becomes extremely useful in many chemical operations, especially in crystallization.

Particular terms have been applied to particular cases of solution.

The solution of a fluid in the atmosphere is termed spontaneous evaporation. It is promoted by exposing a large surface, by frequently renewing the air in contact with the surface, and by increase of temperature.

Some solids have so strong an affinity for water, that they attract it from the atmosphere in sufficient quantity to dissolve them. These are said to deliquesce. Others, on the contrary, retain their water of crystallization with so weak a force, that the atmosphere attracts it from them, so that they crumble into powder. These are said to effloresce. Both operations are promoted by exposing large surfaces, and by a current of air; but the latter is facilitated by a warm dry air, and the former by a cold humid atmosphere.

Solution is also employed to separate substances, (for example, saline bodies), which are soluble in the menstruum, from others which are not.

When our object is to obtain the soluble substance in a state of purity, the operation is termed lixiviation, and as small a quantity of the menstruum as is possible is used. When, however, it is employed to free an insoluble substance from soluble impurities, it is termed edulcoration, which is best performed by using a very large quantity of the menstruum.

Organic products being generally composed of

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heterogeneous substances, are only partially soluble in the different menstrua. To the solution of any of these substances while the others remain undissolved, the term extraction is applied; and when, by evaporation, the substance extracted is reduced to a solid form, it is termed an extract, which is hard or soft, watery or spiritous, according to the degree of consistency it requires, and the nature of the menstruum employed.

Infusion is employed to extract the virtues of aromatic and volatile substances, which would be dissipated by decoction, and destroyed by maceration, and to separate substances of easy solution from others which are less soluble. The process consists in pouring upon the substance to be infused, placed in a proper vessel, the menstruum, either hot or cold, according to the direction, covering it up, agitating it frequently, and after a due time straining or decanting off the liquor, which is now termed the infusion.

Maceration differs from infusion, in being continued for a longer time, and can only be employed for substances which do not easily ferment or spoil.

Digestion, on the other hand, differs from maceration only in the activity of the menstruum being promoted by a gentle degree of heat. It is commonly performed in a glass matrass, which should only be filled one third, and covered with a piece of wet bladder, pierced with one or more small holes, so that the evaporation of the menstruum may be prevented as much as possible, without risk of bursting the vessel. The vessel may be heated, either by means of the sun's rays, of a common fire, or of the sand-bath; and when the last is employed, the vessel should not be sunk deeper in the sand than the portion that is filled. Sometimes, when the menstruum employed is valuable, a distilling apparatus is used to prevent any waste of it. At other times, a blind capital is luted on the matrass, or a smaller matrass is inverted within a larger one; and as the vapour which arises is condensed in it, and runs back into the larger, the process in this form has got the name of circulation, upon which we have observed already.

Decoction is performed by subjecting the substances operated on to a degree of heat which is sufficient to convert the menstruum into vapour, and can only be employed with advantage for extracting principles which are not volatile, and from substances whose texture is so dense and compact as to resist the less active methods of solution. When the menstruum is valuable, that portion of it which is converted into vapour is generally saved by condensing it in a distilling apparatus.

Solutions in alcohol are termed tinctures, and in vinegar or wine, medicated vinegars or wines. The solution of metals in mercury is termed amalgamation. The combinations of other metals with each other form alloys.

Absorption is the condensation of a gas into a fluid or solid form, in consequence of its combination with a fluid or solid. It is facilitated by increase of surface and agitation; and the power of absorption in fluids is much increased by compression and diminution of temperature, although in every instance it be limited and determinate. Dr. Nouth invented an ingenious apparatus for combining gases with fluids, and Messrs. Schweppe, Paul, and Cuthbertson, have very advantageously employed compression.

Fluids often become solid by entering into

combination with solids, and this change is always accompanied by considerable increase of temperature, as in the slaking of lime.

Chemical decomposition is the separation of the elementary parts of bodies which were chemically combined, and can only be effected by the agency of substances possessing a stronger affinity for one or more of the constituents of the compound than these possess for each other.

Decomposition has acquired various appellations, according to the phenomena which accompany it.

Dissolution differs from solution in being accompanied by a decomposition or change in the nature of the substance dissolved. Thus, we correctly say, a solution of lime in muriatic acid, and a dissolution of chalk in muriatic acid.

Sometimes a gas is separated during the action of bodies on each other. When this escapes with considerable violence and agitation of the fluid, it is termed effervescence. The gas is very frequently allowed to escape into the atmosphere, but at other times is either collected in a pneumatic apparatus, or made to enter into some new combination. The vessels in which an effervescing mixture is made should be high and sufficiently large, to prevent any loss of the materials from their running over, and in some cases the mixture must be made slowly and gradually.

Precipitation is the reverse of solution. It comprehends all those processes in which a solid is obtained by the decomposition of a solution. The substance separated is termed a precipitate, if it sink to the bottom of the fluid; or a cream, if it swim above it. Precipitation, like solution, is performed either *vis humida* or *vis sicca*; and is effected by lessening the quantity of the solvent by evaporation; by diminishing its powers, as by reduction of temperature, or dilution; or by the addition of some chemical agent, which form its more powerful affinities. Either combines with the solvent, and precipitates the solvent; or forms itself an insoluble compound with some constituent of the solution.

The objects of precipitation are, the separation of substances from solutions in which they are contained; the purification of solutions from precipitable impurities; or the formation of new combinations.

The two first means of precipitation have been already noticed.

In performing it in the last manner, we may observe the following rules: the solution and precipitant must possess the requisite degree of purity. The solution should be perfectly saturated, to avoid unnecessary expenditure of the solvent or precipitant. The one is to be added slowly and gradually to the other. After each addition, they are to be thoroughly mixed by agitation. We must allow the mixture to settle, after we think that enough of the precipitant has been added, and try a little of the clear solution, by adding to it some of the precipitant; if any precipitation takes place, we have not added enough of the precipitant. This is necessary, not only to avoid loss, but in many instances, the precipitant, if added in excess, re-dissolves or combines with the precipitate.

After the precipitation is completed, the precipitate is to be separated from the supernatant fluid by some of the means already noticed.

When the precipitate is the chief object of our process, and when it is not soluble in water, it is often advisable to dilute, to a considerable degree,

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both the solution and precipitant, before performing the operation. When it is only difficultly soluble, we must content ourselves with washing the precipitate, after it is separated by filtration. In some cases the separation of the precipitate is much assisted by a gentle heat.

Crystallization is a species of precipitation, in which the particles of the solvent, on separating from the solution, assume certain determinate forms.

The conditions necessary for crystallization are, that the integrant particles have a tendency to arrange themselves in a determinate manner, when acted on by the attraction of aggregation; that they be disaggregated, at least so far as to possess sufficient mobility to assume their peculiar arrangement; and that the causes disaggregating them be slowly and gradually removed.

Notwithstanding the immense variety in the forms of crystals, M. Haüy has rendered it probable that there are only three forms of the integrant particles; the parallelopiped, the triangular prism, and the tetrahedron. But as these particles may unite in different ways, either by their faces or edges, they will compose crystals of various forms.

The primitive forms have been reduced to six: the parallelopiped; the regular tetrahedron; the octahedron with triangular faces; the six-sided prism; the dodecahedron terminated by rhombs; the dodecahedron with isoscles triangular faces.

Almost all substances, on crystallizing, retain a portion of water combined with them, which is essential to their existence as crystals, and is therefore denominated water of crystallization. Its quantity varies very much in different crystallizable substances.

The means by which the particles of bodies are disaggregated, so as to admit of crystallization, are solution, fusion, vaporization, or mechanical division and suspension in a fluid medium.

The means by which the disaggregating causes are removed are, evaporation, reduction of temperature, and rest.

When bodies are merely suspended in a state of extreme mechanical division, nothing but rest is necessary for their crystallization.

When they are disaggregated by fusion or vaporization, the regularity of their crystals depends on the slowness with which their temperature is reduced; for if cooled too quickly, their particles have not time to arrange themselves, and are converted at once into a confused or unvaried solid mass. Thus glass, which, when cooled quickly, is so perfectly uniform in its appearance, when cooled slowly has a crystalline texture. But in order to obtain crystals by means of fusion, it is often necessary, after the substance has begun to crystallize, to remove the part which remains fluid, for otherwise it would fill up the interstices among the crystals first formed, and give the whole the appearance of one solid mass. Thus, after a crust has formed on the top of melted sulphur, by pouring off the still fluid part, we obtain regular crystals.

The means by which bodies, which have been disaggregated by solution, are made to crystallize most regularly, vary according to the habitues of the bodies with their solvents and caloric.

Some saline substances are much more soluble in hot than in cold water. Therefore a boiling saturated solution of any of these will deposite, on cooling, the excess of salt, which it is unable to

dissolve, when cold. These salts commonly contain much water of crystallization. Other salts are scarcely, if at all, more soluble in hot than in cold water; and, therefore, their solutions must be evaporated either by heat or spontaneously. These salts commonly contain little water of crystallization.

The beauty and size of the crystals depend upon the purity of the solution, its quantity, and the mode of conducting the evaporation, and cooling.

When the salt is not more soluble in hot than in cold water, by means of gentle evaporation a succession of pellicles are formed on the top of the solution, which either are removed or permitted to sink to the bottom by their own weight; and the evaporation is continued until the crystallization be completed.

But when the salt is capable of crystallizing on cooling, the evaporation is only continued until a drop of the solution, placed upon some cold body, shews a disposition to crystallize, or at farthest only until the first appearance of a pellicle. The solution is then covered up, and set aside to cool, and the more slowly it cools, the more regular are the crystals. The mother-water or solution, which remains after the crystals are formed, may be repeatedly treated in the same way as long as it is capable of furnishing any more salt.

When very large and beautiful crystals are wanted, they may be obtained by laying well-formed crystals in a saturated solution of the same salt, and turning them every day. In this way their size may be considerably increased, though not without limitation, for after a certain time they grow smaller instead of larger.

Crystallization is employed to obtain crystallizable substances in a state of purity; or to separate them from each other, by taking advantage of their different solubility at different temperatures.

General Analyses resulting from the application of Chemical Powers.

The simple elementary substances into which bodies have hitherto been supposed capable of being reduced when submitted to chemical action are light, caloric, electricity, galvanism, magnetism, oxygen, hydrogen, nitrogen, carbon, sulphur, soda, potash, phosphorus, metals, and earths. Of these the first five have no appreciable gravity, which is evinced by all the rest. Of the latter, again, some are combustible, others incombustible; some oxygenizable, others destitute of all affinity for oxygen. But to enter minutely into these subjects would be to transgress the limits of pharmacy, and to infringe upon those which belong to CHEMISTRY as a general science, and to which we refer the reader for farther information. Our object at present is only to take such notice of the above simple substances, as they are called, to which bodies are capable of being reduced, as is more immediately connected with pharmaceutical chemistry, and a knowledge of which is absolutely necessary to the medical practitioner, in order that he may be apprised of the new powers assumed by the materials he employs in the more important changes they undergo, and may be able, with the greater readiness, to ascertain the nature and extent of their action. So little progress, however, have we hitherto made in the general science of chemistry, that perhaps we are even now committing a double error in offering the above as a table of simple elementary substances. It is possible that not one of

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these substances is, strictly speaking, a simple element; or, in other words, totally uncompounded of rudiments that are more simple. We may also be in an error in conceiving every one of them to be a distinct substance from every other: we have many reasons, for example, for supposing that galvanism and electricity are the very same substance, only in different states of modification; and some philosophers have ventured to suspect magnetism, or the magnetic power, is, in like manner, in unity with both.

Neither soda nor potass, again, are any longer to be regarded as simple substances, but mere oxyds of very extraordinary metals, as have been sufficiently ascertained by the valuable experiments of Mr. Davy, who has denominated these metals *SODIUM* and *POTASSIUM*, to the articles contained under which terms we refer our readers.

The earths have perhaps as little claim to simplicity: many of them have been already proved to be metallic oxyds, and the rest will probably follow the same fate. There are also several of the acids which are still admitted into the same division, but whose pretensions are every day becoming still more doubtful; and of which, on this very account, we have taken no notice.

This observation, which will certainly apply to various of the acids hitherto regarded as simple substances, may perhaps apply to all of them. Whatever theory may ultimately prevail with respect to oxymuriatic acid, the compound form of muriatic acid, till of late regarded as one of the simple substances, will still remain as a point universally admitted. The fluoric and boracic acids appear equally to have been decomposed by Mr. Davy, and reduced to their respective elements.

By the same train of experiments, sulphur, charcoal, and phosphorus, have been determined to be compounds; ammonia, though it has not, like the other alkalies, been reduced to a metallic state, has made so far a progress towards it as to have formed an amalgam with quicksilver; and the existence of nitrogen and hydrogen has been called in question, and upon grounds highly plausible, though by no means satisfactory.

Were all these points fully established, we should indeed be reduced to a very small catalogue of simple substances, for nothing would then remain to us but oxygen, light, electricity, and the metallic bases of bodies, which would constitute the four modern elements of the world, as fire, air, earth, and water, constituted those of former times, not one of which is now suffered to exist as an element.

As some compensation, however, for the sweeping destruction and vast hiatus which is hereby produced, it is possible that a variety of new elements or simple substances may yet obtain an acknowledged existence. Oxymuriatic acid, which was not long since conceived not only a compound but a compound of a compound, has for the last two or three years been generally regarded as a substance altogether as simple as oxygen, to which it offers a very striking resemblance; and although this hypothesis is not yet perhaps fully established, and is certainly opposed by various chemists of considerable reputation, the very numerous, ingenious, and accurate experiments of Mr. Davy, upon which it reposes, are of a very commanding character, and require but a very little to set the question completely at rest. He has hence banished the old name of oxymuriatic acid in favour of that of chlorine, in consequence of its yellow-green colour.

At present, however, we are not aware of a claim

put in for the actual simplicity of any other substance hitherto supposed to have been compound: but as the door is open, such facts may follow, though for the general security and permanency of scientific principles it is to be trusted they will not. See the articles *OXYMURIATIC ACID*, *POTASSIUM*, *SODIUM*, *SULPHUR*, &c.

In the present uncertain state of chemical science, however, it is not perhaps possible, and if possible, certainly would not be expedient, to relinquish the general principles which have hitherto been supposed to be established, while treating upon a subject of such high practical consequence and importance as that of pharmacy: and hence, though we have thought it right to follow up the actual state of analytic investigation to the existing period, by noticing the most recent experiments and opinions, we must for the present leave them where they are till they shall appear before us in a form that shall command our conviction, and compel us to allow them a local habitation within the region of medicine in consequence of their being universally allowed to possess such an habitation without it.

PART II.—PHARMACEUTICAL PREPARATIONS.

The classes into which these are divided have a considerable difference, as well in number as in arrangement in our different collegiate pharmacopœias: all of which have endeavoured to keep pace in some degree with the progress of science, not only in adopting more expert and accurate modes of preparing chemical compounds, and in selecting new simple materials of high character and reputation, which cannot but be approved of, but in employing, to a very considerable, we had almost said a licentious extent, the new names under which the faction or caprice, as well as the improved knowledge of the day, have compelled us to recognize many an old acquaintance.

Nothing, however, of real moment has hitherto been attempted by any of them in the way of systematic arrangement—a point we certainly did expect to find would have met with some attention in the latest of our national pharmacopœias, we mean that of the London college. As this, however, has not been done for us, we must attempt it as well as we are able for ourselves, under the following form:

1. Acida,	Acids.
2. Alkalina,	Alkalines.
3. Terrea,	Earths.
4. Sulphurea,	Sulphureous preparations.
5. Metallica,	Metallic preparations.
6. Olea fixata,	Fixed oils.
7. Aquæ distillatæ,	Distilled waters.
8. Olea volatilâ,	Volatile oils.
9. Spiritus distillati,	Distilled spirits.
10. Decocta,	Decoctions.
11. Infusa,	Infusions.
12. Mucilagines,	Mucilages.
13. Syrupa,	Syrups.
14. Mellita,	Medicated honeys.
15. Misturæ et emulsiones,	Mixtures and emulsions.
16. Acetæ,	Medicated vinegars.
17. Tincturæ,	Tinctures.
18. Ætheræ,	Etherials and alcohols.
19. Vina,	Medicated wines.
20. Extracta,	Extracts.
21. Pulveres,	Powders.
22. Confectiones,	Confections.
23. Trochisci,	Troches.
24. Pilulæ,	Pills.

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25. Cataplasms,	Cataplasms.
26. Linimenta,	Liniments.
27. Unguenta,	Ointments.
28. Cerata,	Cerates.
29. Emplastra,	Plasters.

CLASS I.—*Acida. Acids.*

The preparations under this name chiefly in use, and for which forms are given in the modern college dispensaries, are,

Sulphuric or vitriolic,
Diluted sulphuric,
Nitric,
Diluted nitric,
Muriatic,
Vinegar, or acetic acid distilled,
Benzoic,
Succinic.

Nitrous acid is frequently impure. Sulphuric acid is easily got rid of by re-distilling the nitrous acid from a small quantity of nitrat of potass. But its presence is not indicated when nitrous acid forms a precipitate with nitrat of baryt, as affirmed by almost all chemical authors; for nitrat of baryt was discovered by Mr. Hume to be insoluble in nitrous acid.

Muriatic acid is detected by the precipitate formed with nitrat of silver, and may be separated by dropping into the nitrous acid a solution of nitrat of silver, as long as it forms any precipitate, and drawing off the nitrous acid by distillation.

The general properties of nitrous acid have been already noticed. Mr. Davy has shown that it is a compound of nitric acid and nitric oxyd, and that by additional doses of the last constituent its colour is successively changed from yellow to orange, olive-green, and blue-green; and its specific gravity is diminished.

Vinegar may be distilled either in a common still or in a retort. The better kinds of wine-vinegar should be used. Indeed, with the best kind of vinegar, if the distillation be carried on to any great length, it is extremely difficult to avoid empyreuma. The best method of preventing this inconvenience is, if a retort be used, to place the sand but a little way up its sides, and when somewhat more than half the liquor is come over, to pour on the remainder a quantity of fresh vinegar equal to the liquor drawn off. This may be repeated three or four times; the vinegar supplied at each time being previously heated. The addition of cold liquor would not only prolong the operation, but also endanger the breaking of the retort.

Lowitz recommends the addition of half an ounce of recently-burnt and powdered charcoal to each pound of vinegar in the still, as the best means of avoiding empyreuma.

If the common still be employed, it should likewise be occasionally supplied with fresh vinegar, in proportion as the acid runs off, and this continued until the process can be conveniently carried no farther. The distilled acid must be rectified by a second distillation in a retort or glass alembic; for although the head and receiver be of glass or stone ware, the acid will contract a metallic taint from the pewter worm.

The residuum of this process is commonly thrown away as useless, although, if skilfully managed, it may be made to turn to good account, the strongest acid still remaining in it. Mixed with about three times its weight of fine dry sand, and committed to distillation in a retort, with a

well-regulated fire, it yields an exceedingly strong empyreumatic acid. It is, nevertheless, without any rectification, better for some purposes, as being stronger, than the pure acid; particularly for making acetate of potass or soda: for then the empyreumatic oil is burnt out.

Distilled vinegar should be colourless and transparent; have a pungent smell, and purely acid taste, totally free from acrimony and empyreuma, and should be entirely volatile. It should not form a black precipitate on the addition of a solution of baryta, or of water saturated with sulphuretted hydrogen; or change its colour when super-saturated with ammonia. These circumstances show, that it is adulterated with sulphuric acid, or contains lead, copper, or tin.

Distilled acetic acid, in its effects on the animal economy, does not differ from vinegar, and as it is less pleasant to the taste, it is only used for pharmaceutical preparations.

CLASS II.—*Alkalina. Alkalines.*

The following are the chief preparations under this head:

Carbonas potassæ. Carbonat of potass, Lond. Edin. Prepared kali; mild vegetable alkali; salt of tartar.

Potassa fusa, Lond. Pure kali; caustic vegetable alkali.

Potassa cum calce. Lime with pure kali; mild caustic.

Aqua potassæ, Edin. Lond. Water of potass; caustic ley.

Acetis potassæ, Edin. Acetite of potass; acetated kali, Lond.

Acetas potassæ, Lond. Acetate of potass.

Sulphas potassæ, Edin. Lond. Sulphate of potass; vitriolated tartar.

Carbonas potassæ, et subcarbonas, Lond. Vitriolated kali.

Sulphas potassæ, et sulphure, Edin. Lond. Sulphate of potass with sulphur; sal polychres.

Sulphuretum potassæ, Edin. Lond. Sulphuret of potass; liver of sulphur.

Supersulphas potassæ, Lond.

Tartris potassæ, Edin. Tartrate of potass; soluble tartar; tartarised kali.

Tartras potassæ, Lond.

Carbonas sodæ, Edin. Lond. Carbonate of soda; prepared natron.

Phosphas sodæ, Edin. Lond. Phosphate of soda. Murias sodæ. Muriate of soda; sea-salt.

Sulphas sodæ, Edin. Lond. Sulphate of soda. Natron vitriolatum. Glauber's salt.

Tartris sodæ, Ed. Tartrate of soda. Natron tartarisatum, old Lond. Rochelle salt.

Alcohol ammoniatum, Ed. Ammoniated alcohol; spirit of ammonia, Lond.

Carbonas ammoniæ, Ed. Lond. Carbonate of ammonia; prepared ammonia.

Aqua carbonatis ammoniæ, Ed. Water of carbonate of ammonia.

Liquor carb. ammon. Lond.

Aqua acetitis ammoniæ, Edin. Water of acetite of ammonia; spirit of mindererus.

Hydrosulphuretum ammoniæ. Hydrosulphuret of ammonia.

CLASS III.—*Terrena. Earths and earthy Salts.*

The following are the preparations chiefly in use.

Murias barytæ. Muriate of baryt, Edin.

Liquor calcis, Lond.

Aqua calcis. Lime-water. Edin. Dubl.

Calx, Lond.

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Carbonas calcis præparatus. Prepared chalk, Lond. Carbonat of lime, Edin.

Phosphas calcis, Edin. Phosphat of lime; burnt hartshorn, Lond.

Magnesia, Lond.

Carbonas magnesiæ, Edin. Lond. Magnesia alba, Dubl. Carbonat of magnesia.

Phosphas calcis, Edin. Magnesia usta, old Lon. Burnt or calcined magnesia.

Sulphas aluminæ exsiccat, Edin. Dried sulphat of alumine; burnt alum.

Alumen exsiccatum, Lond.

In the Dublin process for making magnesia there is a mutual decomposition of the two salts employed. The potass unites itself to the sulphuric acid, while the carbonic acid combines with the magnesia. The large quantity of water used is necessary for the solution of the sulphat of potass formed; and the boiling is indispensably requisite for the expulsion of a portion of the carbonic acid, which retains a part of the magnesia in solution. Sulphat of potass may be obtained from the liquor which passes through the filter, by evaporation. This is not pure, however, but mixed with undecomposed carbonat of potass; for 100 parts of crystallized carbonat of potass are sufficient for the decomposition of 125 parts of sulphat of magnesia; and as the carbonat of potass of commerce contains a larger proportion of alkali than the crystallized carbonat, a still less proportion should be used. From these quantities about 45 parts of carbonat of magnesia are obtained.

The ablutions should be made with very pure water; for nicer purposes distilled water may be used, and soft water is in every case necessary. Hard water for this process is peculiarly inadmissible, as the principle in waters, giving the property called hardness, is generally a salt of lime, which decomposes the carbonate of magnesia, by compound affinity, giving rise to carbonate of lime, while the magnesia unites itself to the acid of the calcareous salt, by which the quantity of the carbonate is not only lessened, but is rendered impure by the admixture of carbonate of lime. Another source of impurity is the silica which the subcarbonate of potass generally contains. It is most easily got rid of by exposing the alkaline solution to the air for several days before it is used. In proportion as it becomes saturated with carbonic acid, the silica is precipitated, and may be separated by filtration.

The carbonat of magnesia thus prepared is a very light, white, opaque substance, without smell or taste, effervescing with acids. It is not, however, saturated with carbonic acid. By decomposing sulphat of magnesia by an alkaline carbonat, without the application of heat, carbonat of magnesia is gradually deposited in transparent, brilliant, hexagonal crystals, terminated by an oblique hexagonal plane, and soluble in about 460 times its weight of water. The crystallized carbonat of magnesia consists of 50 acid, 25 magnesia, and 25 water; the sub-carbonat consists of 48 acid, 40 magnesia, and 12 water; and the carbonat of commerce of 34 acid, 45 magnesia, and 21 water. It is decomposed by all the acids, potass, soda, baryta, lime, and strontian, the sulphat, phosphat, nitrat, and muriat of alumina, and the super-phosphat of lime.

CLASS IV.—Sulphurea.

The preparations under this head are few: we need only enumerate the two following.

Sulphur lotum, Lond. Washed flowers of sulphur.

Sulphur præcipitatum, Lond. Precipitated sulphur.

In preparing this last, instead of dissolving sulphuret of potass in water, we may gradually add sublimed sulphur to a boiling solution of potass, until it be saturated. When the sulphuretted potass is thrown into water, it is entirely dissolved, but not without decomposition, for it is converted into sulphat of potass, hydroguretted sulphuret of potass, and sulphuretted hydroguret of potass. The two last compounds are again decomposed on the addition of any acid. The acid combines with the potass, sulphuretted hydrogen flies off in the form of gas, while sulphur is precipitated. It is of little consequence what acid is employed to precipitate the sulphur. The London college order the sulphuric; while the Dublin college use nitrous acid, probably because the nitrat of potass formed is more easily washed away than sulphat of potass.

Precipitated sulphur does not differ from well-washed sublimed sulphur, except in being much dearer. Its paler colour is owing to its more minute division, or according to Dr. Thomson, to the presence of a little water; but from either circumstance it derives no superiority to compensate for the disagreeableness of its preparation.

These are all the more simple preparations of sulphur in common use. There are various preparations into which sulphur enters as an ingredient, but these, as constituting compounds of the general nature of metals, alkalines, oils, &c. will be found under those classes.

CLASS V.—Metallica. Metalline preparations.

The metalline preparations are very numerous; especially those of antimony and quicksilver.

Antimonii oxydum, Lond.

Sulphuretum antimonii præparatum, Lond. Ed. Prepared antimony.

Oxydum antimonii cum sulphure per nitratem potasse, Edin. Crocus of antimony, Lond.

Oxydum antimonii cum sulphure. Vitrified antimony, Edin. Glass of antimony.

Sulphuretum antimonii præcipitatum. Precipitated sulphuret, or sulphur of antimony, Lond.

Murias antimonii, Edin. Muriated antimony; butter of antimony.

Oxydum antimonii cum phosphate calcis, Edin. Pulvis antimonialis, Lond. Antimonial powder.

Tartris antimonii. Tartarized or tartrit of antimony.

Antimonium tartarisatum, Lond. Tartar emetic.

Vinum tartritis antimonii, Edin. Antimonial wine.

Liquor antimonii tartarisati, Lond.

Nitras argenti, Lond. Edin. Nitrat of silver; lunar caustic.

Arsenici oxydum præparatum, Lond. Prepared oxyd of arsenic.

Ærugo præparata, Dubl. Prepared verdigrise, or carbonat of copper.

Solutio sulphatis cupri composita, Edin. Styptic water.

Cuprum ammoniatum, Lond.

Ammoniæretum cupri, Edin. Ammoniacal copper.

Liquor cupri ammoniati, Lond. Water of the same.

Ferri limatura purificata, Edin. Purified iron filings.

Carbonas ferri, Edin. Lond. Carbonat or rust of iron.

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Sulphas ferri, Edin. Lond. Vitriolated iron; sulphat of iron.

Tinctura muriatis ferri. Tincture of muriat of iron, Lond.

Murias ammoniæ et ferri. Martial flowers; ammoniacal iron.

Tinctura ejusdem. Tincture of the same.

Tinctura ferri ammoniati, Lond.

Vinum ferri, Lond. Wine of iron.

Hydrargyrus purificatus, Lond. Purified quicksilver.

Acetis hydrargyri, Edin. Acetite of quicksilver.

Murias hydrargyri, Edin. Lond. Muriat of quicksilver; corrosive sublimate.

Oxymurias hydrargyri, Lond. The same.

Submurias hydrargyri, Edin. Lond. Calomel.

Submurias hydrargyri præcipitatus, Edin. Mild muriated quicksilver.

Hydrargyrus præcipitatus albus, Lond. White precipitate.

Hydrargyrus calcinatus, Dubl. Lond. Calcined quicksilver.

Oxydum hydrargyri rubrum, Edin. Lond. Red precipitate.

Subsulphas hydrargyri flavus, Edin. Vitriolated quicksilver, Lond. Turpeth mineral.

Sulphuretum hydrargyri nigrum, Edin. Æthiops mineral.

Hydrargyri sulphuretum rubrum, Lond.

Hydrargyrus sulphuratum rubrum, Dubl. Facitious cinnabar.

Hydrargyri nitrico-oxydum, Lond.

Hydrargyri oxydum cinereum, Lond.

Acetis plumbi, Edin. Acetite of lead; sugar of lead.

Liquor plumbi acetatis, Lond. Extract of lead.

Plumbi superacetatis. Acetated cerussa, Lond.

Oxydum zinci, Edin. Lond. Oxyd of zinc; calcined zinc.

Carbonas zinci impurus præparatus, Edin. Prepared calamine.

Oxydum zinci impurum præparatum, Ed. Prepared tutty.

Sulphas zinci, Edin. Lond. Vitriolated zinc.

The antimonial powder of the London college is supposed to be nearly the same with the celebrated nostrum of Dr. James, the composition of which was ascertained by Dr. Pearson of London, to whom we are also indebted for the usual formula.

By burning sulphuret of antimony and shavings of hartshorn in a white heat, the sulphur is entirely expelled, and the antimony is oxydized, while the gelatine of the hartshorn is destroyed, and nothing is left but phosphat of lime, combined with a little lime. Therefore, the mass which results is a mixture of oxyd of antimony and phosphat of lime, which corresponds, at least as to the nature of the ingredients, with James's powder, which, by Dr. Pearson's analysis, was found to consist of 43 phosphat of lime, and 57 oxyd of antimony. Another excellent chemist, Mr. Chenevix, has lately proposed a method of forming the same combination in the humid way, with the view of obtaining a preparation always similar in its composition and properties. He was led to this proposal by considering the uncertainty of the application, and the precarious nature of the agency of fire, by which means a variable portion of the oxyd of antimony may be volatilized, and that which remains may be oxydized in various degrees.

Mr. Chenevix therefore proposes to prepare a substitute for James's powder, by dissolving together equal weights of submuriat of antimony and of phosphat of lime in the smallest possible quantity

of muriatic acid, and then pouring this solution gradually into water sufficiently alkalinized with ammonia. For the reason mentioned in the preceding article, it is absolutely necessary that the muriatic solution be poured into the alkaline liquor. By an opposite mode of procedure, the precipitate would contain more antimony at first, and towards the end the phosphat of lime would be predominant, and the antimony would be partly in the state of a submuriat. The phosphat of lime is most conveniently obtained pure by dissolving calcined bone in muriatic acid, and by precipitating it by ammonia. If the ammonia be quite free from carbonic acid, no muriat of lime is decomposed. Mr. Chenevix also found, that his precipitate is entirely soluble in every acid which can dissolve either phosphat of lime or oxyd of antimony separately, and that about 0.28 of James's powder, and at an average 0.44 of the pulvis antimonialis of the London Pharmacopœia, resist the action of every acid.

CLASS VI.—*Olea fixata. Fixed oils.*

These oils are improperly denominated expressed, which is their usual characteristic name, as in some instances they are obtained without expression, and in other instances expression is employed to obtain volatile oils. The Edinburgh college have therefore distinguished these different classes of oils by the terms Fixed and Volatile, which actually characterize them.

Fixed oil is seldom formed in any other part of vegetables than in their seeds. Sometimes, although very rarely, it is contained in the parenchyma of the fruit. Of this the best known example is the olive. But it is most commonly found in the seeds of dicotyledonous vegetables, sometimes also in the fruit of monocotyledonous plants, as the cocos butyracea. It has various degrees of consistency, from the tallow of the croton sebiferum of China, and the butter of the butter-tree of Africa, to the fluidity of olive oil.

Fixed oils are either, 1. Fat, easily congealed, and not inflammable by nitric acid, oil of olives, almonds, rapeseed, and ben. 2. Drying, not congealable, inflammable by nitric acid, oil of linseed, nut, and poppy. 3. Concrete oils, palm oil, &c.

Fixed oil is separated from fruits and seeds which contain it, either by expression or decoction. Heat, by rendering the oil more limpid, increases very much the quantity obtained by expression; but as it renders it less bland, and more apt to become rancid, heat is not used in the preparation of oils which are to be employed in medicine. When obtained by expression, oils often contain a mixture of mucilage, starch, and colouring matter; but part of these separate in course of time, and fall to the bottom. When oils become rancid, they are no longer fit for internal use, but are then said to effect the killing of quicksilver, as it is called, more quickly. Decoction is principally used for the extraction of the viscid and consistent oils, which are melted out by the heat of the boiling water, and rise to its surface.

Those who prepare large quantities of the oil of almonds blanch them, by steeping them in very hot water, which causes their epidermis to swell, and separate easily. After they peel them, they dry them in a stove, then grind them in a mill like a coffee-mill, and lastly, express the oil from the paste inclosed in a hempen bag. By blanching the almonds, the paste which remains

within the bag is sold with greater advantage to the perfumers, and the oil obtained is perfectly colourless. But the heat employed disposes the oil to become rancid, and the colour the oil acquires from the epidermis does not injure its qualities. For pharmaceutical use, therefore, the oil should not be expressed from blanched almonds, but merely rubbed in a piece of coarse linen, to separate the brown powder adhering to the epidermis, as much as possible. Sixteen ounces of sweet almonds commonly give five ounces and a half of oil. Bitter almonds afford the same proportions, but the oil has a pleasant bitter taste. See the article *OILS*.

In this manner are to be expressed,

Oleum amygdalæ, almond oil, from the kernel.

Oleum lini, linseed oil, from the bruised seeds.

Oleum ricini, castor oil, from the seeds previously decorticated.

Oleum sinapis, oil of mustard, from the bruised seeds.

CLASS VII.—*Aque distillate*. Distilled waters.

Substances which differ in volatility may be separated from each other by applying a degree of heat capable of converting the most volatile into vapour, and by again condensing this vapour in a proper apparatus. Water is converted into vapour at 212° , and may be separated by distillation from the earthy and saline matters which it always contains in a natural state. But it is evident, that if any substances which are as volatile as water be exposed to the same degree of heat, either by immersing them in boiling water, or exposing them to the action of its steam, they will rise with it in distillation. In this way the camphor and volatile oils of vegetable substances are separated from the more fixed principles; and as water is capable of dissolving a certain quantity of these volatile substances, it may be impregnated with a great variety of flavours by distilling it from different aromatic substances. If the subject of our distillation contain more volatile oil than the water employed is capable of dissolving, it will render the water milky, and afterwards separate from it. It is in this way that essential oils are obtained.

Essential oils are obtained only from odoriferous substances; but not equally from all of this class, nor in quantity proportional to their degree of odour. Some, which, if we were to reason from analogy, should seem very well fitted for this process, yield extremely little oil, and others none at all. Roses and chamomile flowers, whose strong and lasting smell promises abundance, are found to contain but a small quantity of oil: the violet and jessamine flower, which perfume the air with their odour, lose their smell upon the gentlest coction, and do not afford any oil, on being distilled, unless immense quantities are submitted to the operation at once; while savin, whose disagreeable scent extends to no great distance, gives out the largest proportion of oil of almost any vegetable known.

Nor are the same plants equally fit for this operation, when produced in different soils or seasons, or at different times of their growth. Some yield more oil if gathered when the flowers begin to fall off than at any other time. Of this we have examples in lavender and rue; others, as sage, afford the largest quantity when young, before they have sent forth any flowers; and others, as thyme, when the flowers have just ap-

peared. All fragrant herbs yield a larger proportion of oil, when produced in dry soils and in warm summers, than in opposite circumstances. On the other hand, some of the disagreeable strong-scented ones, as wormwood, are said to contain most oil in rainy seasons, and when growing in moist rich grounds.

Several chemists have been of opinion, that herbs and flowers, moderately dried, yield a greater quantity of essential oil than if they were distilled when fresh. It is, however, highly improbable, that the quantity of essential oil will be increased by drying; on the contrary, part of it must be dissipated and lost. But drying may sometimes be useful in other ways; either by diminishing the bulk of the subject to be distilled, or by causing it to part with its oil more easily.

The choice of proper instruments is of great consequence for the performance of this process to advantage. There are some oils which pass freely over the swan-neck of the head of the common still: others, less volatile, cannot easily be made to rise so high. For obtaining these last, we would recommend a large low head, having a rim or hollow canal round it: in this canal, the oil is detained in its first ascent, and thence conveyed at once into the receiver, the advantages of which are sufficiently obvious.

With regard to the proportion of water to be employed; if whole plants, moderately dried, are used, or the shavings of woods, as much of either may be put into the vessel as, lightly pressed, will occupy half its cavity; and as much water may be added as will fill two thirds of it. When fresh and juicy herbs are to be distilled, thrice their weight of water will be fully sufficient; but dry ones require a much larger quantity. In general, there should be so much water, that after all intended to be distilled has come over, there may be liquor enough left to prevent the matter from burning to the still. The water and ingredients, altogether, should never take up more than three fourths of the still; there should be liquor enough to prevent any danger of an empyreuma, but not so much as to be apt to boil over into the receiver.

The subject of distillation should be macerated in the water until it be perfectly penetrated by it. To promote this effect, woods should be thinly shaved across the grain, or sawn, roots cut transversely into thin slices, barks reduced into coarse powder, and seeds slightly bruised. Very compact and tenacious substances require the maceration to be continued a week or two, or longer; for those of a softer and looser texture, two or three days are sufficient; while some tender herbs and flowers not only stand in no need of maceration, but are even injured by it. The fermentation which was formerly prescribed in some instances, is always hurtful.

With regard to the fire, the operator ought to be expeditious in raising it at first, and to keep it up during the whole process, to such a degree only, that the oil may freely distil; otherwise the oil will be exposed to an unnecessary heat; a circumstance which ought as much as possible to be avoided. Fire communicates to all these oils a disagreeable impregnation, as is evident from their being much less grateful when newly distilled, than after they have stood for some time in a cool place: and the longer the heat is continued, the greater alteration it produces in them.

The greater number of oils require for their dis-

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distillation the heat of water strongly boiling: but there are many also which rise with a heat considerably less; such as those of lemon and citron peel; of the flowers of lavender and rosemary, and of almost all the more odoriferous kinds of flowers. We have already observed, that these flowers have their fragrance much injured, or even destroyed, by beating or bruising them; it is impaired also by the immersion in water in the present process, and the more so in proportion to the continuance of the immersion and the heat; hence oils, distilled in the common manner, prove much less agreeable in smell than the subjects themselves. For the distillation of substances of this class, another method has been contrived; instead of being immersed in water, they are exposed only to its vapour. A proper quantity of water being put into the bottom of the still, the odoriferous herbs or flowers are laid lightly in a basket, of such a size that it may enter into the still, and rest against its sides, just above the water. The head being then fitted on, and the water made to boil, the steam, percolating through the subject, imbibes the oil, without impairing its fragrance, and carries it over into the receiver. Oils thus obtained possess the odour of the subject in an exquisite degree, and have nothing of the disagreeable scent perceivable in those distilled by boiling them in water in the common manner.

Plants differ so much, according to the soil and season of which they are the produce, and likewise according to their own ages, that it is impossible to fix the quantity of water to be drawn from a certain weight of them to any invariable standard. The distillation may always be continued as long as the liquor runs well flavoured off the subject, but no longer.

In the distillation of essential oils, the water, as was observed in a foregoing section, imbibes always a part of the oil. The distilled liquors here treated of are no other than water thus impregnated with the essential oil of the subject; whatever smell, taste, or virtue, is communicated to the water, or obtained in the form of watery liquor, being found in a concentrated state in the oil.

All those vegetables, therefore, which contain an essential oil, will give over some virtue to water by distillation: but the degree of the impregnation of the water, or the quantity of water which the plant is capable of saturating with its virtue, are by no means in proportion to the quantity of its oil. The oil saturates only the water that comes over at the same time with it: if there be more oil than is sufficient for this saturation, the surplus separates, and concretes in its proper form, not miscible with the water that arises afterwards. Some odoriferous flowers, whose oil is in so small quantity that scarcely any visible mark of it appears, unless fifty or an hundred pounds or more are distilled at once, give nevertheless as strong an impregnation to water as those plants which abound most with oil.

Many have been of opinion, that distilled waters may be more and more impregnated with the virtues of the subject, and their strength increased to any assigned degree, by cohobation, that is, by re-distilling them repeatedly from fresh parcels of the plant; experience, however, shews the contrary. A water, skillfully drawn in the first distillation, proves, on every repeated one, not stronger, but more disagreeable.

Aqueous liquors are not capable of imbibing above a certain quantity of the volatile oil of vegetables; and this they may be made to take up by one, as well as by any number of distillations: the oftener the process is repeated, the ungrateful impression which they generally receive from the fire, even at the first time, becomes greater and greater.

Those plants which do not yield at first waters sufficiently strong, are not proper subjects for this process.

The mixture of water and oil which comes over, may either be separated immediately, by means of a separatory, or after it has been put into large narrow-necked bottles, and placed in a cool place, that the portion of oil which is not dissolved in the water may rise to the top, or sink to the bottom, according to its specific gravity. It is then to be separated, either by a separatory, or by means of a small glass syringe; or by means of a filter of paper; or, lastly, by means of a woollen thread, one end of which is immersed in the oil, and the other lower end in a phial: the oil will thus pass over into the phial by capillary attraction, and the thread is to be squeezed dry.

Most distilled waters, when first prepared, have a somewhat unpleasant smell, which, however, they gradually lose: it is therefore advisable to keep them for some days after their preparation in vessels but slightly covered; and not to cork them up until they lose that smell.

That the waters may keep the better, about one-twentieth part of their weight of proof spirit may be added to each after they are distilled. I have been informed by a respectable apothecary, that if the simple distilled waters be rectified by distilling them a second time, they will keep for several years without the addition of any spirit, which always gives an unpleasant flavour, and is often objectionable for other reasons.

Distilled waters are employed chiefly as grateful diluents, as suitable vehicles for medicines of greater efficacy, or for rendering disgusting ones more acceptable to the palate and stomach: few are depended on, with any intention of consequence by themselves.

To the chapter on simple distilled waters, the London college annexed the following remarks in the old pharmacopoeia.

“We have ordered most of the waters to be distilled from the dried herbs, because fresh are not ready at all times of the year. Whenever the fresh are used, the weights are to be increased. But, whether the fresh or dried herbs be employed, the operator may vary the weight according to the season in which they have been produced and collected.” The same directions, with but little alteration, are contained in the new.

Herbs and seeds kept beyond the space of a year become less proper for the distillation of waters.

To every gallon of these waters add five ounces, by measure, of proof spirit.

The Edinburgh college order half an ounce of proof spirit to every pound of the water, which is nearly the same.

But the Dublin college order five ounces of proof spirit to be added to each pound, which is probably a typographical error.

Water itself is ordered to be distilled, to give it greater purity; and the substances from which

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distilled waters are to be drawn, are as follows: the weight of each being sufficient for a gallon.

Two pounds of fresh orange-peel, Edin.

Aqua citri aurantii.

One pound of sweet fennel-seeds bruised, Lond. Dubl.

Aqua fœniculi dulcis.

Six pounds of the recent petals of the damask rose, the London Pharmacopœia directs eight pounds,

Aqua rosæ centifoliæ, Edin.

Aqua rosæ, Lond. Dub.

Three pounds, Edin. one pound and a half, Lond. Dubl. of peppermint.

Aqua menthæ piperitæ, Edin.

Aqua menthæ piperitidis, Lond. Dub.

Three pounds, Edin. one pound and a half, Lond. Dubl. of pennyroyal, in flower,

Aqua menthæ pulegii, Edin.

Aqua pulegii, Lond. Dubl.

Two pounds of fresh lemon-peel,

Aqua citri medicæ, Edin.

One pound and a half of spearmint,

Aqua menthæ sativæ, Dubl. Lond.

One pound of cinnamon, (macerated for a day) Lond. Dubl.

Aqua lauri cinnamoni, Edin.

Aqua cinnamoni, Lond. Dubl.

One pound of cassia,

Aqua lauri cassiæ, Edin.

One pound of bruised dill seeds,

Aqua anethi, Lond.

Half a pound of pimento, (macerated for a day), Lond.

Aqua myrti pimentæ, Edin.

Aqua pimento, Lond.

The virtues of all these waters are nearly alike; and the peculiarities of each will be easily understood by consulting the account given in the *materia medica*, of the substance from which they are prepared. Mr. Nicholson mentions, that as rose-water is exceedingly apt to spoil, the apothecaries generally prepare it in small quantities at a time from the leaves, preserved by packing them closely in cans with common salt. This we understand is not the practice in Edinburgh, and indeed cannot succeed with the petals of the damask rose, for they lose their smell by drying. The London apothecaries, therefore, probably use the red rose. The spoiling of some waters is owing to some mucilage carried over in the distillation; for, if rectified by a second distillation, they keep perfectly.

CLASS VIII.—*Olea volatilika. Volatile oils.*

These are prepared nearly in the same manner as distilled waters, except that less water is to be added.

Seeds, and woody substances, are to be previously bruised, or rasped. The oil comes over with the water, and is afterwards to be separated from it, according as it may be lighter than the water, and swim upon its surface, or heavier, and sink to the bottom.

Besides, in preparing distilled waters and oils, it is to be observed, that the goodness of the subject, its texture, the season of the year, and similar causes must give rise to so many differences, that no certain or general rule can be given to suit accurately each example. Hence, the following is the mode prescribed by the London college.

The seeds of anise and caraway, the flowers of chamomile and lavender, the berries of juniper and allspice, and the tops of rosemary; and in the remaining instances the whole plants dried are to be employed. Introduce any of these substances into an alembic, and pour on as much water as will cover it; then distil the oil into a large refrigerator.

According to these directions are prepared the volatile, distilled, or essential oils; or *olea volatilika*, Edin. *distilla*, Dub. *vel essentialia*, Lond.

Anise, *pimpinellæ anisi*, Edin. *anisi*, Lond. Dub. *chamomile anthemidis*, Lond.

Caraway, *carui*, Lond. Dub.

Fennel seeds, *seminum fœniculi dulcis*, Dub. from the seeds.

Juniper berries, *juniperi communis*, Edin. *baccarum juniperi*, Dub. *juniperi baccae*, Lond. from the berries.

Pimento, *myrti pimentæ*, Edin. from the fruit.

Fennel flowers, *florum fœniculi dulcis*, Dub.

Rosemary, *rosmarinum officinalis*, Edin. *rosmarini*, Lond. Dub.

Lavender, *lavendulæ spicæ*, Edin. *lavandulæ*, Lond.

Peppermint, *menthæ piperitæ*, Edin. Lond. Dub.

Spearmint, *menthæ sativæ*, m. *viridis*, Lond. Dub.

Pennyroyal, *pulegii*, Lond. Dub.

Origano, *origani*, Lond. Dub.

Rue, *rutæ*, Dub.

Savine, *juniperi sabinæ*, Edin. *sabinæ*, Dub. from the flower, or herb in flower.

Sassafras, *lauri sassafras*, Edin.

And, turpentine, *pinus picea*, from the resin.

The residuum, after the oil has been extracted, is the official resin (*resina flava*): and a rectified spirit is obtained by distilling the oil of turpentine with four times its weight of water.

The spirit of turpentine, as this essential oil has been styled, is frequently taken internally as a diuretic and sudorific; and it has sometimes a considerable effect when taken to the extent of a few drops only. It has, however, been given in much larger doses, especially when mixed with honey. Recourse has principally been had to such doses in cases of chronic rheumatism, particularly in those modifications of it which are termed sciatica and lumbago; but sometimes it induces bloody urine.

The water employed in the distillation of volatile oils always imbibes some portion of the oil; as is evident from the smell, taste, and colour, which it acquires. It cannot, however, retain above a certain quantity; and therefore, such as has been already used and almost saturated itself, may be advantageously employed, instead of common water, in a second, third, or any future distillation of the same subject.

After the distillation of one oil, particular care should be had to clean the worm perfectly before it be employed in the distillation of a different substance. Some oils, those of wormwood and aniseeds for instance, adhere to it so tenaciously, as not to be melted out by heat, or washed off by water; the best way of removing these is to run a little spirit of wine through it.

Volatile oils, after they are distilled, should be suffered to stand for some days, in vessels loosely covered with paper, till they have lost their disagreeable fiery odour, and become limpid; then put them up in small bottles, which are to be

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kept quite full, closely stopped, in a cool place. With these cautions, they will retain their virtues in perfection for many years.

Most of the oils mentioned above are prepared by our chemists in Britain, and are easily procurable in a tolerable degree of perfection; but the oils from the more expensive spices, though still introduced among the preparations in the foreign pharmacopœias, are, when employed among us, usually imported from abroad.

These are frequently so much adulterated that it is not easy to meet with such as are at all fit for use. Nor are these adulterations easily discoverable. The grosser abuses, indeed, may be readily detected. Thus, if the oil be mixed with spirit of wine it will turn milky on the addition of water; if with expressed oils, rectified spirit will dissolve the volatile, and leave the other behind; if with oil of turpentine, on dipping a piece of paper in the mixture, and drying it with a gentle heat, the turpentine will be betrayed by its smell. But the more subtle artists have contrived other methods of sophistication, which elude all trials of this kind.

Some have looked upon the specific gravity of oils as a certain criterion of their genuineness. This, however, is not to be absolutely depended on; for the genuine oils, obtained from the same subjects, often differ in gravity as much as those drawn from different ones. Cinnamon and cloves, whose oils usually sink in water, yield, if slowly and warily distilled, oils of great fragranc, which are nevertheless specifically lighter than the aqueous fluid employed in their distillation; whilst on the other hand, the last runnings of some of the lighter oils prove sometimes so ponderous as to sink in water.

As all volatile oils agree in the general properties of solubility in spirit of wine, indissolubility in water, miscibility with water by the intervention of certain intermedia, volatility in the heat of boiling water, &c. it is plain that they may be variously mixed with each other, or the dearer sophisticated with the cheaper, without any possibility of discovering the abuse by any trials of this kind. And, indeed, it would not be of much advantage to the purchaser, if he had infallible criteria of the genuineness of every individual oil. It is of as much importance that they be good, as that they be genuine; for genuine oils, from inattentive distillation, and long and careless keeping, are often weaker doth in smell and taste than the common sophisticated ones.

The smell and taste seem to be the only certain tests of which the nature of the thing will admit. If a bark should have, in every respect, the appearance of good cinnamon, and should be proved indisputably to be the genuine bark of the cinnamon tree; yet if it want the cinnamon flavour, or has it but in a low degree, we reject it; and the case is the same with the oil. It is only from use and habit, or comparisons with specimens of known quality, that we can judge of the goodness either of the drugs themselves, or of their oils.

Most of the volatile oils indeed are too hot and pungent to be tasted with safety; and the smell of the subject is so much concentrated in them, that a small variation in this respect is not easily distinguished; but we can readily dilute them to any assignable degree. A drop of the oil may be dissolved in spirit of wine, or received on a bit of sugar, and dissolved by that intermedium in water. The quantity of liquor which it

thus impregnates with its flavour, or the degree of flavour which it communicates to a certain determinate quantity, will be the measure of the degree of goodness of the oil.

Medical use. Volatile oils, medicinally considered, agree in the general qualities of pungency and heat; in particular virtues they differ as much as the subjects from which they are obtained, the oil being the direct principle in which the virtues, or at least a considerable part of the virtues, of the several subjects reside. Thus the carminative virtue of the warm seeds, the diuretic of juniper berries, the emmenagogue of savin, the nervin of rosemary, the stomachic of mint, the antiscorbutic of scurvy-grass, the cordial of aromatics, &c. are supposed to be concentrated in their oils.

There is another remarkable difference in volatile oils, the foundation of which is less obvious, that of the degree of their pungency and heat. These are by no means in proportion, as might be expected, to those of the subject they were drawn from. The oil of cinnamon, for instance, is excessively pungent and fiery; in its undiluted state it is almost caustic: whereas cloves, a spice which in substance is far more pungent than the other, yields an oil which is far less so. This difference seems to depend partly upon the quantity of oil afforded, cinnamon yielding much less than cloves, and consequently having its active matter concentrated into a smaller volume; partly, upon a difference in the nature of the active parts themselves: for though volatile oils contain always the specific odour and flavour of their subjects, whether grateful or ungrateful, they do not always contain the whole pungency: this resides frequently in a more fixed matter, and does not rise with the oil. After the distillation of cloves, pepper, and some other spices, a part of their pungency is found to remain behind: a simple tincture of them in rectified spirit of wine is even more pungent than their pure essential oils.

The more grateful oils are frequently made use of for reconciling to the stomach medicines of themselves disgusting. It has been customary to employ them as correctors for the resinous purgatives; an use which they do not seem to be well adapted to. All the service they can here be of is to make the resin sit more easily at first on the stomach: far from abating the irritating quality upon which the violence of its operation depends, these pungent oils superadd a fresh stimulus.

Volatile oils are never given alone, on account of their extreme heat and pungency; which in some is so great, that a single drop let fall upon the tongue produces a gangrenous eschar. They are readily imbibed by pure dry sugar, and in this form may be conveniently exhibited. Ground with eight or ten times their weight of sugar they become soluble in aqueous liquors, and thus may be diluted to any assigned degree. Mucilages also render them miscible with water into an uniform milky liquor. They dissolve likewise in spirit of wine; the more fragrant in an equal weight, and almost all of them in less than four times their own quantity. These solutions may be either taken on sugar, or mixed with syrups, or the like. On mixing them with water the liquor grows milky, and the oil separates.

The more pungent oils are employed externally against paralytic complaints, numbness, pains, and aches, cold tumours, and in other cases where particular parts require to be heated or stimu-

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lated. The tooth-ach is sometimes relieved by a drop of these almost caustic oils, received on cotton, and cautiously introduced into the hollow tooth.

Among the volatile oils ought also to be enumerated the empyreumatic oils; for these also are volatile, but have a character peculiar to themselves. The simple volatile oils exist ready formed in the aromatic substances from which they are obtained, and are only separated from the fixed principles by the action of a heat not exceeding that of boiling water. The empyreumatic, on the contrary, are always formed by the action of a degree of heat considerably higher than that of boiling water, and are the product of decomposition, and a new arrangement of the elementary principles of substances, containing at least oxygen, hydrogen, and carbon. Their production is therefore always attended with the formation of other new products. In their chemical properties they do not differ very remarkably from the volatile oils, and are principally distinguished from them by their unpleasant, pungent smell, and rough, bitterish taste. The following are the chief:

Oleum petrolei, oil of bitumen, or tar.

Oleum succini, oil of amber, which is afterwards rectified.

Oleum animale, animal oil, obtained from harts-horn, which also is rectified by being again distilled with water.

CLASS IX. *Spiritus distillati. Distilled spirits.*

The flavour and virtues of distilled waters are owing, as observed in the preceding chapter, to their being impregnated with a portion of the essential oil of the subject from which they are drawn. Alcohol, considered as a vehicle for these oils, has this advantage above water, that it keeps all the oil that rises with it perfectly dissolved into an uniform limpid liquor.

Nevertheless, many substances, which, on being distilled with water, impart to it their virtues in great perfection; if treated in the same manner with alcohol, scarcely give over to it any smell or taste. The cause of this difference is, that alcohol is not susceptible of so great a degree of heat as water. It is obvious, therefore, that substances may be volatile enough to rise with the heat of boiling water, but not with that of boiling alcohol.

Thus if cinnamon, for instance, be committed to distillation with a mixture of alcohol and water, or with a pure proof spirit, which is no other than a mixture of about equal parts of the two; the alcohol will arise first clear, colourless, and transparent, and almost without any taste of the spice: but as soon as the more ponderous watery fluid begins to arise, the oil comes freely over with it, so as to render the liquor highly odorous, sapid, and of a milky hue.

The proof spirits usually met with in the shops are accompanied with a degree of ill flavour, which, though concealed by means of certain additions, plainly discovers itself in distillation. This nauseous flavour does not begin to arise till after the purer spiritous part has come over, which is the very time that the virtues of the ingredients begin also to arise most plentifully; and hence the liquor receives an ungrateful taint. To this cause principally is owing the general complaint, that the cordials of the apothecary are less agreeable than those of the same kind prepared by the distiller; the latter being extremely curious in recti-

fying or purifying the spirits (when designed for what he calls fine goods) from all unpleasant flavour.

Spiritus cari carvi, Edin. spirit of caraway. Take of caraway seeds half a pound; diluted alcohol nine pounds. Macerate two days in a close vessel; then pour on as much water as will prevent empyreuma, and draw off by distillation nine pounds.

Spiritus carui, Lond. Dub. spirit of caraway. Take of caraway seeds, bruised, half a pound; proof spirit of wine one gallon; (nine pounds, Dub.) water sufficient to prevent empyreuma. Draw off one gallon, (nine pounds, Dub.)

In the same manner is prepared the same quantity of spirit from

Cinnamon, one pound,

Spiritus lauri cinnamomi, Edin.

Spiritus cinnamomi, Lond. Dub.

Peppermint, one pound and a half,

Spiritus menthæ piperitæ, Edin. Lond.

Spearmint, one pound and a half,

Spiritus menthæ viridis, Lond.

Pennyroyal dried, a pound and a half,

Spiritus pulegii, Lond.

Nutmeg, well bruised, two ounces,

Spiritus myristicæ (moschatæ,) Edinburgh. London.

Spiritus nucis moschatæ, Dub.

Pimento, half a pound,

Spiritus myrti pimentæ, Edin.

Spiritus pimentæ, Dub. Lond.

The rest belonging to this division are obtained from

Lavender,

Spiritus lavandulæ, Lond.

Spiritus lav. spicæ, Edin.

Rosemary,

Spiritus rosmarini, Lond. Edin.

Anise, &c.

Spiritus anisi compositus, Lond.

Juniper, &c.

Spiritus juniperi compositus, Lond. Edin. Dub.

Horse-radish, &c.

Spiritus raphani compositus, Dub.

Armoracia comp. Lond.

Assafoetida,

Spiritus ammoniæ fetidus, Lond.

CLASS X. *Decocta. Decoctions.*

Decoctions and infusions differ chiefly in the employment of boiling or of cold water. At the same time, however, that the increase of temperature in decoctions facilitates and expedites the solution of some fixed principles, it gives others a tendency to decomposition, and dissipates all volatile matters. Decoction, therefore, can only be used with advantage for the extraction of principles which are neither volatilized nor altered by a boiling heat.

To promote the action of the menstruum, infusion is sometimes premised to decoction.

In compound decoctions it is sometimes convenient not to put in all the ingredients from the first, but in succession, according to their hardness, and the difficulty with which their virtues are extracted; and if any aromatic, or other substances, containing volatile principles, enter into the composition, the boiling decoction is to be simply poured upon them, and covered up until it cool.

Decoctions should be made in vessels sufficient-

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ly large to prevent any risk of boiling over, and should be continued without interruption, and gently.

The official preparations under this class are,
Decoctum aloes compositum, Lond.

Decoctum althææ officinalis, Edin. decoction of marshmallows.

Decoctum anthemidis nobilis, Edin. decoction of chamomile flowers.

Decoctum cinchonæ, Lond. Edin. decoction of Peruvian bark.

Decoctum daphnes mezerei, Edin. decoction of mezereon.

Decoctum geoffrææ inermis, Edin. decoction of cabbage-tree bark.

Decoctum guaiaci officinalis comp. Edin. decoction of the woods.

Decoctum hordei, Lond. hord. distichi, Edin. decoction of barley.

Decoctum polygalæ senegæ, Edin. decoction of seneka.

Decoctum sarsaparillæ, Lond. Dubl. decoctum smilacis sarsaparillæ, Edin. decoction of sarsaparilla.

Decoctum smilacis sarsaparillæ, Edin. decoctum smilacis sarsaparilla, comp. Dubl. Lond. decoction of compound of the same.

Decoctum ulmi, Lond. decoction of elm.

Decoctum cydoniæ, Lond. decoction of quince.

Decoctum dulcamaræ, Lond. decoction of woody night-shade.

Decoctum lichenis, Lond. decoction of liverwort.

Decoctum malvæ comp. Lond. decoction of mallow, compound.

Decoctum papaveris, Lond. decoction of poppy.

Decoctum quercus, Lond. decoction of oak-bark.

CLASS XI. *Infusa. Infusions.*

We have already explained the sense in which we employ the term infusion. We confine it to the action of a menstruum, not assisted by ebullition, or any substance consisting of heterogeneous principles, some of which are soluble, and others insoluble, in that menstruum. The term is generally used in a more extensive, but, we are inclined to think, a less correct sense. Thus, lime water and the mucilages, which are commonly classed with the infusions, are instances of simple solution, and the chalk mixture is the mechanical suspension of an insoluble substance. When the menstruum used is water, the solution is termed simply an infusion; but when the menstruum is alcohol, and upon a colouring material, it is called a tincture; when wine or vinegar, a medicated wine or vinegar. Infusions in water are extremely apt to spoil, and are generally extempore preparations.

The following are those officially prescribed:

Infusum cinchonæ, Edin. infusion of Peruvian bark.

Infusum digitalis purpureæ, Edin. infusion of fox-glove.

Infusum gentianæ compositum, Lond. infusum gentianæ luteæ comp. Edin. infusion of gentian, compound.

Infusum mimosæ catechu, Edin. infusion of catechu.

Infusum rei palmati, Edin. infusion of rhubarb, Lond.

Infusum rosæ, Lond. infusum rosæ Gallicæ, Edin. infusion of roses.

Infusum sennæ, Lond. Dubl. infusion of senna.

Infusum tamarindi Ind. cum cassia senna, Edin. infusion of tamarinds and senna.

To these, which have been long in use, the London College has now added infusions of chamomile, horse-radish, orange-peel, calumba, cloves, cascarrilla, cusparia (angustura) and linseed.

CLASS XII. *Mucilagines. Mucilages.*

These, as officially prescribed, are as follow:

Mucilago amyli, Lond. Edin. mucilage of starch, obtained by boiling.

Mucilago tragacanthæ, Lond. mucilago astragalitragac. Edin. mucilago gummi tragac. Dubl. mucilage of tragacanth, obtained by trituration with boiling water.

Mucilago mimosæ niloticæ, Edin. mucilago acaciæ, Lond. mucilage of gum arabic, obtained as the preceding.

CLASS XIII. *Syrupi. Sytups.*

In making these, the following is the proportion where no particulars are mentioned in respect to the weight of sugar.

Take of double-refined sugar twenty-nine ounces; any kind of liquor one pint, (one pint and a half, Dubl.); dissolve the sugar in the liquor, in a water bath; (mix and boil down to one pound, Dubl.); then set it aside for twenty-four hours; take off the scum, and pour off the syrup from the feces if there be any.

Syrups are solutions of sugar in any watery fluid, whether simple or medicated. Simple syrup is nutritious and demulcent. When made of fine sugar, it is transparent and colourless. If necessary, it is easily clarified by beating to a froth the white of an egg with three or four ounces of water, mixing it with the syrup, and boiling the mixture for a few seconds, until the albumen coagulates, and enveloping all heterogeneous matters, it forms a scum, which may be easily taken off, or separated by filtration. When, instead of simple water, any other fluid is used for dissolving the sugar, the syrup is then medicated. Medicated syrups are prepared either with express juices, infusions, decoctions, or saline fluids. The object of forming these into syrups, is either to render them agreeable to the palate, or to preserve them from fermentation. In the latter case, the quantity of sugar added becomes a matter of great importance; for if too much be employed the sugar will separate by crystallization; and if too little, instead of preventing fermentation, it will accelerate it. About two parts of sugar to one of fluid are the proportions directed by the British Colleges with this view. But as, in some instances, a larger quantity of fluid is added, and afterwards reduced to the proper quantity by decoction, it will not be superfluous to point out some circumstances which show the evaporation to have been carried far enough. These are the tendency to form a pellicle on its surface, when a drop of it is allowed to cool, the receding of the last portion of each drop, when poured out drop by drop, after it is cold; and, what is most to be relied on, its specific gravity when boiling hot being about 1.385, or 1.3 when cold. The syrup which remains, after all the crystallizable sugar has been separated from it, has been much, and probably justly, recommended by some for the preparation of medicated syrups and electuaries, although its pharmaceutical superiority is actually owing to its impurity.

The following are the official preparations.

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Syrupus simplex, Edin. simple syrup.
Syrupus acidi acetosi, Edin. syrup of acetous acid.

Syrupus allii, Dubl. syrup of garlic.
Syrupus althææ, Lond. Edin. syrup of marsh-mallows.

Syrupus zingiberis, Lon. syrupus amomi zing. Edin. syrup of ginger.

Syrupus aurantii, Lond. syrupus citri aurantii, Edin. syrup of orange-peel.

Syrupus limonis, Lond. Dubl. syrupus citri medici, Edin. syrup of lemons.

Syrupus succi fructus mori, Dubl. Lond. syrup of mulberries.

Syrupus colchici autumnalis, Edin. syrup of colchicum.

Syrupus dianthi caryophylli, Edin. syrup of cloves; July flowers.

Syrupus croci, Lond. syrup of saffron.

Syrupus mannæ, Dubl. syrup of manna.

Syrupus papaveris somniferi, Edin. syrupus papaveris, Lond. syrup of white poppies.

Syrupus rhæados, Lond. syrup of red poppies.

Syrupus opii, Dubl. syrup of opium.

Syrupus rhamni cathartici, Edin. rhamni, Lond. syrup of buckthorn.

Syrupus rosæ, Lond. syrupus rosæ centifoliæ, Edin. syrup of damask roses.

Syrupus rosæ Gallicia, Edin. syrup of roses.

Syrupus scillæ maritimæ, Edin. syrup of squills.

Syrupus sennæ, Lond. syrup of senna.

Syrupus toluanus, Lond. syrupus toluiferæ balsami, Edin. syrup of balsam of tolu.

Syrupus violæ odoratæ, Edin. syrup of violets.

CLASS XIV.—*Mellita. Medicated honeys.*

Honey itself is first to be despumated or clarified by dissolving it in a water-bath, and removing the scum as it arises. The following preparations are then made of it.

Mel. Lond. honey, boracis of borax.

Mel. rosæ, Lond. Dubl. honey of roses.

Mel. scillæ, Lond. honey of squills.

Oxymel scillæ, Lond. oxymel of squills.

CLASS XV.—*Misturæ et emulsiones. Mixtures and emulsions.*

This double class comprehends preparations in which oils and other substances, insoluble in water, are mixed with, and suspended in, watery fluids, by means of such viscid substances as mucilages and syrups. In the new London Pharmacopœia, the word emulsion is altogether omitted, and the articles are referred to the division of mixtures.

Emulsio amygdalæ communis, Edin. mist. amygdalæ, Lond. almond emulsion.

Emulsio arabica, Edin. Dubl. gum arabic emulsion.

Emulsio camphorata, Edin. mistura camphoræ, Lond. camphorated emulsion or mixture.

Mistura ammoniaci, Lond. lac ammonia, Dubl. emulsion of gum ammoniac.

Mistura asæ fetidæ, Lond. lac asafœtida, emulsion of asafœtida.

Mistura moschi, Lond. musk mixture.

Mistura crétæ, Lond. chalk mixture.

CLASS XVI.—*Aceta. Medicated vinegars.*

Infusions of vegetable substances in acetic acid are commonly called medicated vinegars. The action of the acid in this case may be considered as twofold.

1. It acts simply as water, in consequence of

the great quantity of water which enters into its composition, and generally extracts every thing which water is capable of extracting.

2. It exerts its own peculiar action as an acid. In consequence of this it sometimes increases the solvent power of its watery portion, or dissolves substances which water alone is incapable of dissolving, and in a few instances it impedes the solution of substances which water alone would dissolve.

As acetic acid, in itself sufficiently perishable, has its tendency to decomposition commonly increased by the solution of any vegetable matter in it, it should never be used as a menstruum, unless where it promotes the solution of the solvent, as in extracting the acrid principle of squills, colchicum, &c. and in dissolving the volatile, and especially the empyreumatic oils, or where it coincides with the virtues of the solvent.

Acetum aromaticum, Edin. aromatic vinegar, thieves vinegar.

Acetum colchici, Dub. Lond. vinegar of meadow saffron.

Acetum scillæ, Lond. acetum scillæ maritimæ, Edin. vinegar of squills.

Acidum acetosum camphoratum, Edin. camphorated acetous acid.

CLASS XVII.—*Tincturæ. Tinctures.*

The term tincture has often been employed in a very vague sense. It is now commonly applied to coloured solutions, made by digestion, in alcohol, or diluted alcohol. But it is also, though perhaps incorrectly, extended to solutions in ether, ethereal spirits, and spirit of ammonia.

Alcohol is capable of dissolving resins, gum resins, extractive, tannin, sugar, volatile oils, soaps, camphor, adipocere, colouring matters, acids, alkalies, and some compound salts. Many of these, as the gum resins, soaps, extractive, tannin, sugar, and saline substances, are also soluble in water, while water is capable of dissolving substances, such as gum, gelatine, and most of the compound salts, which are insoluble in alcohol. But the insolubility of these substances in the different menstrua is not absolute, but merely relative; for a certain proportion of alcohol may be added to a solution of gum in water without decomposing it; and a solution of resin in alcohol will bear a certain admixture of water without becoming turbid. Therefore, diluted alcohol, which is a mixture of these two menstrua, sometimes extracts the virtues of heterogeneous compounds more completely than either of them separately.

Alcohol is used as a menstruum.

1. When the solvent is not soluble, or sparingly soluble, in water.

2. When a watery solution of the solvent is extremely perishable.

3. When the use of alcohol is indicated as well as that of the solvent.

In making alcoholic tinctures, we must observe, that the virtues of recent vegetable matters are very imperfectly extracted by spirituous menstrua. They must therefore be previously carefully dried, and as we cannot assist the solution by means of heat, we must facilitate it by reducing the solvent to a state of as minute mechanical division as possible. To prevent loss, the solution is commonly made in a close vessel, and the heat applied must be very gentle, lest it be broken by the expansion of vapour.

The action of tinctures on the living system is always compounded of the action of the men-

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strum, and of the matters dissolved in it. Now, these actions may either coincide with, or oppose, each other; and as alcohol is at all times a powerful agent, it is evident that no substance should be exhibited in the form of a tincture, whose action is different from that of alcohol, unless it be capable of operating in so small a dose, that the quantity of alcohol taken along with it is inconsiderable.

Tinctures are not liable to spoil, as it is called, but they must nevertheless be kept in well closed phials, especially when they contain active ingredients, to prevent the evaporation of the menstruum.

They generally operate in doses so small, that they are rarely exhibited by themselves, but commonly combined with some vehicle. In choosing the latter, we must select some substance which does not decompose the tincture, or at least separates nothing from it in a palpable form.

The London college direct all tinctures, except that of muriat of iron, to be prepared in closed phials.

The Dublin college explain, that, when they order substances to be digested, they mean it be done with a low degree of heat; and when they are to be macerated, it is to be done with a degree of heat between 60° and 90°.

Tinctura aloes, Lond. *tinctura succotorinæ*, Edin. tincture of aloes.

Tinctura aloes composita, Lond. *tinctura aloes cum myrrha*, Edin. tincture of aloes with myrrh.

Tinctura cardamomi, Lond. *tinctura amomi repetitis*, Edin. tincture of cardamoms.

Tinctura serpentariæ, Lond. *tinctura aristolochiæ serpentariæ*, Edin. tincture of snake-root.

Tinctura assæ fetidæ, Lond. *tinctura of asafoetida*.

Tinctura aurantii corticis, Lond. *tinctura of orange-peel*.

Tinctura benzoini composita, Lond. *tinctura of benjamin*, compound.

Tinctura camphoræ, Edin. *spiritus camphoratus*, Lond. *tincture of camphor*, camphorated spirit.

In this the Edinburgh title is grossly inaccurate; the preparation being quite colourless instead of tintured.

Tinctura cascarillæ, Lond. *tinctura of cascarilla*.

Tinctura sennæ, Lond. *tincture of senna*.

Tinctura cassiæ sennæ composita, Edin. *tincture of senna compound*; elixir of health.

Tinctura castorei, Lond. *tincture of castor*.

Tinctura cinchonæ, Lond. *tincture of Peruvian bark*.

Tinctura cinchonæ composita, Lond. *tincture of Peruvian bark, compound*.

Tinctura calumbæ, Lond. *tincture of Columbo*.

Tinctura jalapæ, Lond. *tinctura convolvuli jalapæ*, Edin. *tincture of jalap*.

Tinctura croci, Edin. *tincture of saffron*.

Tinctura digitalis purpureæ, Edin. *tincture of foxglove*.

Tinctura gentianæ composita, Lond. *tincture of gentian, compound*.

Tinctura guaiaci, Edin. *tincture of guaiacum*.

Tinctura hellebori nigri, Lond. *tincture of black hellebore*.

Tinctura hyoscyami nigri, Edin. *tincture of henbane*.

Tinctura kino, Edin. *tincture of kino*.

Tinctura cinnamoni, Lond. *tinctura lauri cinnamomi*, Edin. *tincture of cinnamon*.

Tinctura lauri cinnamomi composita, Edin. *tincture of cinnamon, compound*.

Tinctura lavendula comp. *Dubl. spiritus lavendulæ comp.* *Lond. spiritus lavendulæ spicæ comp.* *Edin. tincture of lavender, and spirit of lavender*.

Here the Dublin title is wrong; the tincture is not derived from the lavender, but from the red saunders.

Tinctura cantharidis, *Dubl. tinctura meloes vesicatorii*, *Edin. tinctura lyttæ*, *Lond. tincture of cantharides*.

Tinctura misosæ catechu, *Edin. tincture of catechu*.

Tinctura moschi, *Dubl. tincture of musk*.

Tinctura myrrhæ, *Lond. Edin. tincture of myrrh*.

Tinctura opii, *Lond. Edin. tincture of opium*.

Tinctura opii camphorata, *Dubl. tincture of opium camphorated*.

Tinctura camphoræ composita, *Lond. compound tincture of camphor*. Here the Dublin title is right, and the London erroneous; the tincture is not produced from the camphor, but from the opium.

Tinctura rhabbari, *Dubl. tinctura rhei palmati*, *Edin. tincture of rhabarb*.

Tinctura rhei composita, *Lond. tincture of rhabarb, compound*.

Tinctura rhei cum aloe, *Edin. tincture of rhabarb with aloes*.

Tinctura rhei cum gentiana, *Edin. tincture of rhabarb with gentian*.

Tinctura saponis, *Edin. linimentum saponis compositum*, *Lond. linimentum saponaceum, tincture of opodeldoc*.

Tinctura saponis cum opio, *Edin. anodyne liniment*.

Tinctura scillæ, *Lond. tincture of squill*.

Tinctura bals. tolutani, *Dubl. tinctura toluiferæ balsamic*, *Edin. tincture of balsam of tolu*.

Tinctura valerianæ, *Lond. tincture of valerian*.

Tinctura ammoniata, *Lond.*

Tinctura veratri albi, *Edin. tincture of white hellebore*.

Tinctura zingiberis, *Lond. tincture of ginger*.

Tinctura humuli, *tincture of hop*, *Lond.*

Tinctura kino, *tincture of kino*, *Lond.*

CLASS XVIII.—*Ætherea. Etherial spirits.*

Alcohol, alcohol.

Æther sulphuricus, *Edin. æther vitriolicus*, *Lond. tincture of sulphuric ether, vitriolic ether*.

Æther sulphuricus cum alcohol, *Edin. spiritus ætheris vitriolici*, *Lond. spirit of ether*.

Spiritus ætheris vitriolici, *comp. Lond. Hoffman's anodyne liquor*.

Spiritus ætheris nitrosi, *Edin. spirit of nitrous ether*.

Linimentum camphoræ compositum, *Lond. compound camphor liniment*.

Linimentum volatile, *Dubl. volatile liniment*.

Alcohol ammoniatum aromaticum, *Edin. spiritus ammoniæ*, *Lond. sal volatile*.

Spiritus ammoniæ succinatus, *Lond. amber, spirit of ammonia, or eau de luce*.

Tinctura castorei composita, *Edin. compound tincture of castor*.

Tinctura guaiaci ammoniata, *Edin. tincture of guaiacum*.

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Tinctura opii ammoniati, Edin. tincture of opium.

Tinctura valerianæ ammoniata, Lond. Dubl. tincture of valerian.

CLASS XIX.—*Vina. Medicated wines.*

M. Parmentier has occupied thirty-two pages of the *Annales de Chimie*, to prove that wine is an extremely bad menstruum for extracting the virtues of medicinal substances. His argument (for there is but one), is, that by the infusion of vegetable substances in wine, its natural tendency to decomposition is so much accelerated, that at the end of the process, instead of wine, we have only a liquor containing the elements of bad vinegar. As a solvent, diluted alcohol perfectly supersedes the use of wine; and if we wish to use wine to cover the taste, or to assist the operation of any medicine, M. Parmentier proposes, that a tincture of the substance should be extemporaneously mixed with wine as a vehicle.

Notwithstanding this argument appears to us to have great weight, we shall allow to the medicated wines, retained in the pharmacopœias, the characters they still generally possess.

Vinum aloes, Lond. vinum aloes succotorinæ, Edin. wine of aloes.

Vinum gentianæ compositum, Edin. wine of gentian, compound.

Vinum ipecacuanhæ, Lond. Dubl. wine of ipecacuan.

Vinum nicotianæ tabaci, Edin. wine of tobacco.

Vinum opii, Lond. wine of opium.

Vinum rhabarbari, Lond. vinum rhei palmati, Edin. wine of rhubarb.

The metallic wines have been noticed already.

CLASS XX.—*Extracta. Extracts.*

Extract, in pharmacy, has been long used in the true and general sense of the term, to express a substance extracted from bodies of all kinds, by the action of whatever menstruum, and reduced to spissitude by the evaporation of that menstruum. Of late, however, it has been employed in a different and more limited sense, as the name for a peculiar principle, which is often, indeed, contained in extracts, and which before had no proper appellation. It is in the former sense that we employ it here, and in which we wish it to be only used, while a new word should be invented as the name of the new substance. Till a better be proposed, we shall call it extractive.

Extracts are of various kinds, according to the nature of the substances from which they are obtained, and the menstruum employed; but they commonly consist of gum, sugar, extractive, tannin, gallic acid, or resin, or several of them mixed in various proportions. The menstrea most commonly employed are water and alcohol. The former is capable of extracting all the substances enumerated except the resin, and the latter all except the gum. Wine is also sometimes employed, but very improperly; for as a solvent it can only act as a mixture of alcohol and water, and the principles which it leaves behind on evaporation are rather injurious than of advantage to the extract.

Water is the menstruum most economically employed in making extracts, as it is capable of dissolving all the active principles except resin, and can have its solvent powers assisted by a considerable degree of heat.

Watery extracts are prepared by boiling the subject in water, and evaporating the strained decoction to a thick consistence.

It is indifferent, with regard to the medicine, whether the subject be used fresh or dry; since nothing that can be preserved in this process will be lost by drying. With regard to the facility of extraction, there is a very considerable difference; vegetables in general giving out their virtues more readily when moderately dried than when fresh.

Very compact dry substances should be reduced into exceedingly small parts, previous to the affusion of the menstruum.

The quantity of water ought to be no greater than is necessary for extracting the virtues of the subject. This point, however, is not very easily ascertained; for although some of the common principles of extracts be soluble in a very small proportion of water, there are others, such as the tannin, of which water can dissolve only a certain proportion, and cannot be made to take up more by any length of boiling, and we have no very good method of knowing when we have used a sufficient quantity of water; for vegetable substances will continue to colour deeply successive portions of water boiled with them, long after they are yielding nothing to it but colouring matter. Perhaps one of the best methods is to boil the subject in successive quantities of water, as long as the decoctions form a considerable precipitate with the test which is proper for detecting the substance we are extracting, such as a solution of gelatine for tannin, of alum for extractive, &c.

"The decoctions are to be depurated by colature; and afterwards suffered to stand for a day or two, when a considerable quantity of sediment is usually found at the bottom. If the liquor poured off clear be boiled down a little, and afterwards suffered to cool again, it will deposit a fresh sediment, from which it may be decanted before you proceed to finish the evaporation. The decoctions of very resinous substances do not require this treatment, and are rather injured by it; the resin subsiding along with the inactive dregs."

Such are the directions given in most of Dr. Duncan's editions of the *New Edinburgh Dispensatory*, for the depuration of the decoctions, and we have inserted them at full length, because, although we doubt very much of their propriety, our reasons for so doing are scarcely more than hypothetical. We would advise the decoctions to be evaporated after they have been filtered boiling hot, without any further depuration; because some of the most active principles of vegetable substances, such as tannin, are much more soluble in boiling than in cold water, and because almost all of them are very quickly affected by exposure to the atmosphere. Therefore, if a boiling decoction, saturated with tannin, be allowed to cool, the greatest part of the very principle on which the activity of the substance depends will separate to the bottom, and according to the above directions, will be thrown away as sediment. The same objection applies more strongly to allowing the decoction to cool, and deposit a fresh sediment, after it has been partially evaporated. Besides, by allowing the decoctions to stand several days before we proceed to their evaporation, we are in fact allowing the active principles contained in the decoction to be altered by the action of the air, and to be converted into substances, perhaps

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inactive, which also are thrown away as sediment.

The evaporation is most conveniently performed in broad shallow vessels: the larger the surface of the liquor, the sooner will the aqueous parts exhale. This effect may likewise be promoted by agitation.

When the matter begins to grow thick, great care is necessary to prevent its burning. This accident, almost unavoidable if the quantity be large, and the fire applied as usual under the evaporating pan, may be effectually prevented, by carrying on the inspissation, after the common manner, no farther than the consistence of a syrup, when the matter is to be poured into shallow tin or earthen pans, and placed in an oven, with its door open, moderately heated; which acting uniformly on every part of the liquid, will soon reduce it to any degree of consistence required. This may likewise be done, and more securely, by setting the evaporating vessel in boiling water: but the evaporation is in this way very tedious.

Alcohol is much too expensive to be employed as a menstruum for obtaining extracts, except in those cases where water is totally inadequate to the purpose. These cases are, 1. When the nature of the extract is very perishable when dissolved in water, so that it is liable to be decomposed before the evaporation can be completed, especially if we cannot proceed immediately to the evaporation. 2. When water is totally incapable of dissolving the substance to be extracted; and, 3. When the substance extracted can bear the heat of boiling alcohol, without being evaporated, but would be dissipated by that of boiling water; that is, when it requires a heat greater than 176° , and less than 212° , for its vaporization.

In the last case, the alcohol must be perfectly free from water, because the heat necessary to evaporate it at the end of the process would frustrate the whole operation. Hence, also, the subject itself ought always to be dry: those substances which lose their virtue by drying, lose it equally on being submitted to this treatment with the purest alcohol.

In this way the alcoholic extract of some aromatic substances, as cinnamon, lavender, rosemary, retain a considerable degree of their fine flavour. In the second case, the alcohol need not be so very strong, because it is still capable of dissolving resinous substances, although diluted with a considerable proportion of water. In the first case, the alcohol may be still much weaker: or rather, the addition of a small proportion of alcohol to water will be sufficient to retard or prevent the decomposition of the decoction.

The alcohol employed in all these cases should be perfectly free from any unpleasant flavour, lest it be communicated to the extract.

The inspissation should be performed from the beginning, in the gentle heat of a water-bath. We need not suffer the alcohol to evaporate in the air; the greatest part of it may be recovered by collecting the vapour in common distilling vessels. If the distilled spirit be found to have brought over any flavour from the subject, it may be advantageously reserved for the same purposes again.

When diluted alcohol is employed, the distillation should only be continued as long as alcohol comes over; and the evaporation should be finished in wide open vessels,

Pure resins are prepared, by adding to spirituous tinctures of resinous vegetables a large quantity of water. The resin, incapable of remaining dissolved in the watery liquor, separates and falls to the bottom, leaving in the menstruum such other principles of the plant as the spirit might have extracted at first along with it. But this is only practised for the purpose of analysis.

Extracts made with Water only.—*Extractum gentianæ luteæ*, Edin. extract of gentian. Having cut and bruised any quantity of gentian, pour upon it eight times its quantity of water. Boil to the consumption of one half of the liquor, and strain it by strong expression. Evaporate the decoction immediately to the consistence of thick honey, in a bath of water saturated with muriate of soda.

In the same manner are prepared extracts

Of the roots of liquorice, *extractum glycyrrhizæ glabræ*.

Of the roots of black hellebore, *extractum hellebori nigri*.

Of the leaves of rue, *extractum rutæ graveolentis*.

Of the leaves of senna, *extractum cassiæ senæ*.

Of the flowers of camomile, *extractum anthemidis nobilis* (chamæmeli).

Of the heads of white poppy, *extractum papaveris albi*.

Of logwood, *extractum hæmatoxyli Campechensis*.

Extract of broom tops, *extractum cacuminis genistæ*.

Extract of camomile, *extractum chamæmeli*.

Extract of savin, *extractum sabina*.

The other extracts of this division are,

Extractum cinchonæ, Lond. extract of Peruvian bark.

Extractum hæmatoxyli, Lond. extract of logwood.

Extractum opii, Lond. extract of opium.

Extractum humuli, extract of hop, Lond.

Extracts made with Alcohol and Water—*Extractum cinchonæ officinalis*, Edin. *extractum cinchonæ osum resin*, Lond. resin of bark.

Extractum radici convolvuli jalapæ, Edin. *extractum jalapæ*, Lond. resin of jalap.

Extractum colocynthidis, Lond.

Extractum colocynthidis compositum, compound extract of colocynth.

The following new preparations in the London Pharmacopœia are obtained from the expressed juices alone, without either water or alcohol.

Extractum belladonnæ, extract of belladonna.

Extractum conii, extract of hemlock.

Extractum hyoscyami, extract of henbane.

CLASS XXI. Pulveres. Powders.

This form is proper for such materials only as are capable of being sufficiently dried to become pulverisable without the loss of their virtue. There are several substances, however, of this kind, which cannot be conveniently taken in powder; bitter, acrid, fetid drugs are too disagreeable; emollient and mucilaginous herbs and roots are too bulky; pure gums cohere, and become tenacious in the mouth, fixed alkaline salts deliquesce when exposed to the air, and volatile alkalies exhale. Many of the aromatics, too, suffer a great loss of their odorous principles when kept in powder; as in that form they expose a much larger surface to the air.

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The dose of powders in extemporaneous prescription is generally about half a drachm: it rarely exceeds a whole drachm, and is not often less than a scruple. Substances which produce powerful effects in smaller doses are not trusted to this form, unless their bulk be increased by additions of less efficacy; those which require to be given in larger ones are better fitted for other forms.

The usual vehicle for taking the lighter powders is any agreeable thin liquid. The ponderous powders, particularly those prepared from metallic substances, require a more consistent vehicle, as syrups; for from thin ones they soon subside: resinous substances likewise are most commodiously taken in thick liquors, for in thin ones they are apt to run into lumps, which are not easily again soluble.

Pulvis aloes compositus, Lond. powder of aloes, compound.

Pulvis aromaticus, Dubl. powder aromatic.

Pulvis asari compositus, Dubl. powder of asarabacca, compound.

Pulvis cretæ compositus, Lond. *pulvis carbonatis*, calcis comp. Edin. powder of chalk, compound.

Pulvis cretæ compositus cum opio, Lond. powder of chalk, compound with opium.

Pulvis contrayervæ comp. Lond. powder of contrayerva, compound.

Pulvis ipecacuanhæ comp. Lond. *pulvis ipecacuanhæ et opii*. Edin. powder of Dover's.

Pulvis scammoniæ comp. Lond. Edin. Dubl. powder of scammony, compound.

Pulvis senæ compositus, Lond. powder of sena, compound.

Pulvis sulphatis aluminæ comp. Edin. powder of styptic.

Pulvis tragacanthæ compositus, Lond. powder of tragacanth, compound.

Pulvis cinnamomi com. Lond. compound powder of cinnamon.

Pulvis cornu asticum opio, Lond. powder of burnt hartshorn with opium.

Pulvis kino comp. Lond. compound powder of kino.

CLASS XXII. *Confectiones*. *Confections*.

Under this title we include all those preparations which have hitherto been loosely denominated conserves, electuaries, and confections; the difference in the preparation of which being too trifling for distinct heads: and the new London Pharmacopœia has pursued the same plan.

Confections are, for the most part, compositions of recent vegetable matters and sugar, beaten or otherwise mixed together into an uniform mass. The sugar should be pounded by itself, and passed through a sieve before it be mixed with the vegetable mass, for without this it cannot be properly incorporated. It is obvious that, from the large admixture of sugar, only substances of considerable activity can be taken with advantage in this form. Conservæ are hence, for the most part, only auxiliary to medicines of greater activity; as, for example, for reducing into bolusses or pills the more ponderous powders, as calomel, oxyds of iron, and other mineral preparations.

Electuaries are composed chiefly of powders mixed up with syrups, &c. into such a consistence, that the powders may not separate in keeping, that a dose may be easily taken up on the point of a knife, and not prove too stiff to swallow.

Electuaries receive chiefly the milder alterative medicines, and such as are not ungrateful to the palate. The more powerful drugs, as cathartics, emetics, opiates, and the like (except in official electuaries to be dispensed by weight), are seldom trusted in this form, on account of the uncertainty of the dose: disgusting ones, acrids, bitters, fetids, cannot be conveniently taken in it; nor is the form of an electuary well fitted for the more ponderous substances, as mercurials, these being apt to subside on keeping, unless the composition be made very stiff.

The lighter powders require thrice their weight of honey, or syrup boiled to the thickness of honey, to make them into the consistency of an electuary: of syrups of the common consistence, twice the weight of the powder is sufficient.

Where the common syrups are employed, it is necessary to add likewise a little conserve, to prevent the compound from candying and drying too soon. Electuaries of Peruvian bark, for instance, made up with syrup alone, will often, in a day or two, grow too dry for taking.

This is owing to the crystallization of the sugar. Deyeux, therefore, advises electuaries, confections, and conserves, to be made up with syrups from which all the crystallizable parts have been separated. For this purpose, after being sufficiently evaporated, they are to be exposed to the heat of a stove as long as they form any crystals. The syrup which remains, probably from the presence of some vegetable acid, has no tendency to crystallize, and is to be decanted and evaporated to a proper consistence. In hospital practice, the same object may be obtained much more easily by using molasses instead of syrups.

The quantity of an electuary, directed at a time, in extemporaneous prescription, varies much according to its constituent parts, but is rarely less than the size of a nutmeg, or more than two or three ounces.

The conservæ are,
Citri aurantii, Edin. aur. hispalensis, Lond. conserve of orange peel.

Rosæ caninæ, Edin. Lond. conserve of hips.

Rosæ rubræ, Edin. *rosæ gallica*, Lond. *rosæ*, Dubl. conserve of red rose buds.

Lujulæ, acetosellæ, Dubl. conserve of wood sorrel.

All these are denominated, as we have already observed, confections, instead of conserves in the new London Pharmacopœia.

Pluck the leaves from the stalks, the unblown petals from the cups, taking off the heels. Take the outer rind of the oranges by a grater.

When prepared in this way, beat them with a wooden pestle in a marble mortar, first by themselves, afterwards with three times their weight of double refined sugar, until they be mixed.

The only exceptions to these general directions, which are those of the London college, are, that the London college adds only twenty ounces of sugar to one pound of the pulp of hips, and that the Dublin add only twice their weight of sugar to the sorrel leaves. La Grange says, that by infusing the red rose leaves in four times their weight of water, which is afterwards to be expressed from them, they lose their bitterness, and are more easily reduced to a pulp, which he then mixes with a thick syrup, prepared by dissolving the sugar in the expressed liquor, and boiling it down to the consistence of an electuary.

It is scarcely necessary to make any particular

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remarks on these conserves. Their taste and virtues are compounded of those of sugar, and the substance combined with it. The wood sorrel and hips are acidulous and refrigerant; the orange-rind and wormwood bitter and stomachic, and the red rose buds astringent.

The electuaries and confections are as follow:

Electuarium cassiæ, Dubl. confectio cassiæ, Lond. electuarium cassæ fistulæ, Edin. electuary of cassia.

Electuarium cassiæ sennæ, Edin. confectio sennæ, Lond. electuary lenitive.

Electuarium catechu, Edin. electuary of catechu.

Electuarium catechu, comp. Dubl. electuary of catechu, compound.

Electuarium scammonii, Dubl. confectio scammonii, Lond. electuary of scammony.

Electuarium opiatum, Edin. confectio opiato, Lond. electuary of opium, opiate confection.

Confectio aromatica, Lond. aromatic confection.

Confectio amygdalæ, Lond. almond confection.

CLASS XXII. Trochisci. Troches.

Troches and lozenges are composed of powders made up with glutinous substances into little cakes, and afterwards dried. This form is principally made use of for the more commodious exhibition of certain medicines, by fitting them to dissolve slowly in the mouth, so as to pass by degrees into the stomach: and hence these preparations have generally a considerable proportion of sugar or other materials grateful to the palate. Some powders have likewise been reduced into troches, with a view to their preservation; though possibly for no very good reasons; for the moistening, and afterwards drying them in the air, must in this light be of greater injury than any advantage accruing from this form can counterbalance.

Trochisci carbonatis calcis, Edin. troches of chalk.

Trochisci glycyrrhizæ, Dubl. troches of liquorice.

Trochisci glycyrrhizæ cum opio, Edin. Dubl. troches of liquorice with opium.

Trochisci gummosi, Edin. troches of starch with gum arabic.

Trochisci nitratis potassæ, Edin. troches of nitre.

The London Pharmacopœia has banished the name entirely.

CLASS XXIII. Pilulæ. Pills.

The masses for pills are best kept in bladders, which should be moistened now and then with some of the same kind of liquid that the mass was made up with, or with some proper aromatic oil. When the mass is to be divided into pills, a given weight of it is rolled out into a cylinder of a given length, and of an equal thickness throughout, and is then divided into a given number of equal pieces, by means of a simple machine. These pieces are then rounded between the fingers; and, to prevent them from adhering, they are covered either with starch, or powder of liquorice, or orris root. In Germany the powder of lycopodium is much used.

To this form are peculiarly adapted those drugs which operate in a small dose, and whose nauseous

and offensive taste or smell require them to be concealed from the palate.

Pills should have the consistence of a firm paste, a round form, and a weight not exceeding five grains. Essential oils may enter them in small quantity: deliquescent salts are improper. Efflorescent salts, such as carbonate of soda, should be previously exposed so as to fall to powder: deliquescent extracts should have some powder combined with them. The mass should be beaten until it become perfectly uniform and plastic. Powders may be made into pills with extracts, balsams, soap, mucilages, bread-crumbs, &c.

Gummy resins, and inspissated juices, are sometimes soft enough to be made into pills, without addition: where any moisture is requisite, spirit of wine is more proper than syrups or conserves, as it unites more readily with them, and does not sensibly increase their bulk. Light dry powders require syrup or mucilages: and the more ponderous, as the mercurial and other metallic preparations, thick honey, conserve, or extracts.

Light powders require about half their weight of syrup; or of honey, about three fourths their weight; to reduce them into a due consistence for forming pills. Half a drachm of the mass will make five or six pills of a moderate size.

Gums and inspissated juices are to be first softened with the liquid prescribed: the powders are then to be added, and the whole beat thoroughly together, till they be perfectly mixed.

Pilulæ aloeticæ, Edin. Dubl. pills aloetic.

Pilulæ aloes compositæ, Lond. pills aloetic, compound.

Pilulæ aloes cum asafœtida, Edin. pills aloetic with asafœtida.

Pilulæ aloes cum colocynthide, Edin. pills aloetic with colocynth.

Pilulæ aloes cum myrrha, Lond. pills aloetic with myrrh.

Pilulæ asafœtida compositæ, Edin. pills of asafœtida, compound.

Pilulæ galbani compositæ, Lond. pills of galbanum, compound.

Pilulæ ammoniacreti cupri, Edin. pills of ammoniacret of copper.

Pilulæ hydrargyri, Lond. Edin. Dubl. pills of quicksilver.

Pilulæ saponis cum opio, Lond. pilulæ opiatæ, Edin. pills of opium.

Pilulæ rhei compositæ, Edin. pills of rhubarb, compound.

Pilulæ scillæ comp. Lond. Dubl. Edin. pills of squills.

Pilulæ stibii compositæ, Dubl. pills of antimony, compound: Plummer's.

Pilulæ cambogiæ compositæ, Lond. compound pills of camboge.

The common mercurial pill is one of the best preparations of mercury, and may, in general, supersede most other forms of this medicine. In its preparation the mercury is minutely divided, and probably converted into the black oxyd. To effect its mechanical division it must be triturated with some viscid substance. Soap, resin of guaiac, honey, extract of liquorice, manna, and conserve of roses, have all been at different times recommended. The soap and guaiac have been rejected, on account of their being decomposed by the juices of the stomach; and the honey, because it was apt to gripe some people. With regard to the others, the grounds of selection are not well understood; perhaps the acid contained

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in the conserve of roses may contribute to the extinction of the mercury. We learn when the mercury is completely extinguished, most easily, by rubbing a very little of the mass with the point of the finger on a piece of paper, if no globules appear. As soon as this is the case, it is necessary to mix with the mass a proportion of some dry powder, to give it a proper degree of consistency. For this purpose powder of liquorice root has been commonly used; but it is extremely apt to become mouldy, and to cause the pills to spoil. The Edinburgh College have, therefore, with great propriety, substituted for it starch, which is a very inalterable substance, and easily procured at all times in a state of purity. It is necessary to form the mass into pills immediately, as it soon becomes hard. One grain of mercury is contained in four grains of the Edinburgh mass, in three of the London, and in two and a half of the Dublin. The dose of these pills must be regulated by circumstances; from two to six five-grain pills may be given daily.

CLASS XXIV. *Cataplasmata. Cataplasms.*

By cataplasms are generally understood those external applications which are brought to a due consistence or form for being properly applied, not by means of oily or fatty matters, but by water or watery fluids. Of these many are had recourse to in actual practice; but they are seldom prepared in the shops of the apothecaries, and in some of the best modern Pharmacopœias no formula of this kind is introduced. The London and Dublin Colleges, however, although they have abridged the number of cataplasms, still retain one or two; and it is not without some advantage that there are fixed forms for the preparation of them.

Coagulum aluminis, *Dubl. cataplasm of alum, alum curd.*

Cataplasma fermenti, *yest cataplasm.*

Cataplasma sinapis, *Lond. Dubl. cataplasm of mustard.*

Cataplasms of mustard are commonly known by the name of sinapisms. They were formerly frequently prepared in a more complicated state, containing garlic, black soap, and other similar articles; but the above simple form will answer every purpose which they are capable of accomplishing. They are employed only as stimulants: they often inflame the part and raise blisters, but not so perfectly as cantharides. They are frequently applied to the soles of the feet in the low state of acute diseases, for raising the pulse and relieving the head. The chief advantage they have depends on the suddenness of their action.

CLASS XXV. *Linimenta. Liniments.*

CLASS XXVI. *Unguenta. Ointments.*

CLASS XXVII. *Cerata. Cerates.*

CLASS XXVIII. *Emplastra. - Plasters.*

We connect these together as being all oleaginous or fatty combinations for external application, and as merely differing from each other in their degree of consistency. Deyeux has, indeed, lately defined plasters to be combinations of oil with metallic oxyds; but as this would comprehend many of our present ointments, and exclude many of our plasters, we shall adhere to the old meaning of the terms.

Liniments are the thinnest of these compositions, being only a little thicker than oil.

Ointments have generally a degree of consistence like that of butter.

Cerates are firmer, and contain a larger proportion of wax.

Plasters are the most solid, and when cold should be firm, and not adhere to the fingers; but when gently heated should become sufficiently soft to spread easily, and should then adhere to the skin.

Plasters derive their firmness either from a large proportion of wax, resin, &c. or from the presence of some metallic oxyd, such as that of lead.

Plasters then should have such a consistence, that although when cold they do not adhere to the fingers, they become soft and plastic when gently heated. The heat of the body should render it tenacious enough to adhere to the skin, and to the substance on which it is spread. When prepared, it is usually formed into rolls, and inclosed in paper. Plasters of a small size are often spread on leather, sometimes on strong paper, by means of a heated spatula, or the thumb. The leather is cut of the shape wanted, but somewhat larger; and the margin all round, about a quarter of an inch in breadth, is left uncovered, for its more easy removal when necessary. Linen is also often used, especially for the less active plasters, which are used as dressings, and often renewed. It is generally cut into long slips of various breadths, from one to six inches. These may either be dipped into the melted plaster, and passed through two pieces of straight and smooth wood, held firmly together, so as to remove any excess of plaster; or what is more elegant, they are spread on one side only, by stretching the linen, and applying the plaster, which has been melted and allowed to become almost cold, evenly by means of a spatula, gently heated, or, more accurately, by passing the linen on which the plaster has been laid, through a machine formed of a spatula fixed, by screws, at a proper distance from a plate of polished steel.

To prevent repetition, the Edinburgh College give the following canon for the preparation of these substances:

“In making these compositions, the fatty and resinous substances are to be melted with a gentle heat, and then constantly stirred; adding, at the same time, the dry ingredients, if there be any, until the mixture, on cooling, becomes stiff.”

Linimentum simplex, *Edin. simple liniment, wax and oil.*

Oleum ammoniatum, *Edin. linimentum ammoniæ carbon. Lond. oil or liniment of ammonia, volatile liniment.*

Linimentum ammoniæ fortius, *Lond. volatile liniment, stronger.*

Oleum lini cum calce, *Edin. linseed oil with lime.*

Oleum camphorat, *Ed. camphorated oil.*

Unguentum simplex, *Edin. ointment of simple wax and oil.*

Unguentum spermatis ceti, *Dubl. cetacei, Lond. ointment of spermaceti.*

Unguentum, *Lond. Dubl. ointment of wax.*

Unguentum acidi nitrosi, *Edin. ointment of nitrous acid.*

Unguentum resinæ flavæ, *Dubl. ointment of yellow resin.*

Unguentum elemi, *Dubl. unguentum elemie compositum, Lond. ointment of elemi.*

Unguentum picis, *Lond. Dubl. ointment of tar. The London has two kinds.*

Unguentum sambuci, *Lond. Dubl. ointment of elder.*

Unguentum cantharidis, *Dubl.* ointment of cantharides.

Unguentum infusi meloes vesicatorii, *Edin.* ointment of mild epispastic.

Unguentum pulveris meloes vesicatorii, *Edin.* ointment of stronger epispastic.

Unguentum hellebori albi, *Dubl.* ointment of white hellebore.

Unguentum sulphuris, *Lond. Dubl.* ointment of sulphur.

Unguentum oxydi plumbi albi, *Edin.* ointment of oxyd of white lead.

Unguentum acetitis plumbi, *Edin.* the acetite of lead, saturnine ointment.

Unguentum cerussæ acetatæ, *Dubl.* ointment of acetated ceruse.

Unguentum hydrargyri, *Edin.* ointment of quicksilver.

Unguentum hydrargyri fortius, *Lond. Dubl.* ointment of quicksilver, stronger.

Unguentum hydrargyri mitius, *Lond. Dubl.* ointment of quicksilver, milder.

Unguentum hydrargyri præcipitati albi, *Lond.* ointment of white precipitate.

Unguentum nitratis hydrargyri, *Edin. Lond.* citrine ointment.

Unguentum subacititis cupri, *Edin.* ointment of verdigris.

Unguentum oxyd zinci impuri, unguentum tutiæ, *Dubl.* ointment of tutty.

Unguentum oxydi zinci, *Edin. Lond.* ointment of oxyd of zinc.

Ceratum cetacei, *Lond.*

Ceratum simplex, *Edin.* ceratum spermatis ceti, *Dubl.* cerate of spermaceti.

Ceratum resinæ flavæ, *Dubl.* cerate of yellow resin.

Ceratum cantharidis, *Dubl.* cer. lythæ, *Lond.* cerate of cantharides.

Ceratum saponis, *Dubl.* cerate of soap, cer. plumbi superacetatis, *Lond.*

Ceratum plumbi compositum, *Lond.* saturnine cerate.

Ceratum carbonatis zinci impuri, *Edin.* cerate of carbonate of zinc.

Ceratum calaminæ, *Lond. Dubl.* cerate of calamine; epulotic; *Turner's.*

Emplastrum ceræ, *Dubl. Lond.* emplastrum simplex, *Edin.* plaster of wax, drawing.

Emplastrum picis Burgundicæ, *Dubl.* emplastrum picis Burgundicæ, composit. *Lond.* plaster of Burgundy pitch.

Emplastrum cumini, *Lond.* plaster of cummin.

Emplastrum cantharidis, *Dubl.* emplastrum *Lond.* emplastrum lyttæ *Edin.* plaster of cantharides.

Emplastrum meloes vesicatorii, composit. *Edin.* plaster of cantharides, compound.

Emplastrum oxydi plumbi semivitrei, *Edin.* emplastrum lithargyri, plaster of common litharge.

Emplastrum resinorum, *Edin.* emplastrum lithargyri cum resina, *Lond.* plaster adhesive.

Emplastrum asafetidæ, *Edin.* plaster of gum or asafetida.

Emplastrum plumbi, *Lond.* lead-plaster.

Emplastrum saponis, *Dubl.* *Lond.* emplastrum saponaceum, *Edin.* plaster of soap.

Emplastrum hydrargyri, *Edin.* plaster of quicksilver.

Emplastrum ammoniaci cum hydrargyro, *Lond.* plaster of gum ammoniac with quicksilver.

Emplastrum oxydi ferri rubri, *Edin.* plaster of red oxyd of iron.

We shall close this article by observing, that the adult dose of the different preparations, and materials of which they are composed, will for the most part be found in the article MATERIA MEDICA, and by referring our readers for the chief authorities under which pharmacy has been advanced and brought to its present state of perfection to the article PHARMACOPŒIA.

PHARNACEUM, in botany, a genus of the class pentandria, order trigynia. Calyx five-leaved; corolless; capsule three-celled, many-seeded. Fourteen species - most of them Cape plants, one of Russia, one of Guinea.

PHARO is the name of a game of chance. See PHARAON.

PHAROS, (*Homer, Strabo, &c.*) a small oblong island, adjoining to the continent of Egypt, over against Alexandria. On this island stood a cognominal light-tower, of four sides, each side a stadium in length; and the tower so high as to be seen 100 miles off. Some affirm each of its four corners rested on a large sea-crab of glass, or of hard transparent stone of Ethiopia or Memphis. Others imagine the crabs were only added externally to the base by way of ornament, or as emblematical of its situation and use. The architect was Sostrates the Cnidian, as appears by an inscription on the tower, under Ptolemy Philadelphus, who laid out 800 talents upon it. On account of the port of Alexandria, the entrance to which was difficult and dangerous, the Pharos was called the key of the Egyptian sea, or even of Egypt itself (*Lucan*): and Pharos, from being a proper name, is become an appellation to denote all light-houses.

PHAROS, or PHARE, a light-house; a pile raised near a port, where fire is kept burning in the night, to guide and direct vessels near at hand. The pharos of Alexandria, built in the island of Pharos, at the mouth of the Nile, was anciently very famous, inasmuch as to communicate its name to all the rest. This most magnificent tower consisted of several stories and galleries, with a lantern at top, in which a light being continually burning, might be seen for many leagues at sea, and along the coast. It was accounted one of the seven wonders of the world. It was built by the famed architect Sostrates, a native of Cnidos, or, according to some, by Deiphanes, the father of Sostrates; and cost Ptolemy Philadelphus 800 talents. The several stories were adorned with columns, balustrades, galleries of the finest marble and workmanship; to which some add, that the architect had contrived to fasten some looking-glasses so artificially against the highest galleries, that one could see in them all the ships that sailed on the sea for a great way. Instead of which noble structure, one sees now only a kind of irregular castle, without ditches or outworks of any strength, the whole being accommodated to the inequality of the ground

on which it stands, and which it seems is no higher than that which it should command. Out of the midst of this clumsy building rises a tower, which serves for a light-house, but which hath nothing of the beauty and grandeur of the old one. The Colossus of Rhodes also served as a pharos.

PHARPAR, or **PHARPHAR**, is one of the rivers of Damascus, or rather it is an arm of the Barrady or Chrysorrhoas, which waters the city of Damascus and the country about it (2 Kings v. 12.) "Are not Abana and Pharpar, rivers of Damascus, better than all the waters of Israel?" The river of Damascus has its fountain in the mountains of Libanus.

PHARSALIA, a town of Thessaly, famous for a battle fought near it on 12th of May, B.C. 48, between Julius Cæsar and Pompey, in which the former obtained the victory. Cæsar lost about 200 men, or, according to others, 1200. Pompey's loss was 15,000, or 25,000, according to others, and 24,000 of his army were made prisoners. The poem of Lucan, in which he gives an account of the civil wars of Cæsar and Pompey, bears the name of Pharsalia. See **LUCANUS**.

PHARUS, in botany, a genus of the class monocæcia, order hexandria. Calyx, glume two-valved, [one flowered. Male: corol, glume two-valved. Fem.: corol, glume one-valved, long, involving; seed one. Three species: grasses of the East and West Indies.

PHARYNGOTOMY. *s.* (φαρυγξ and τεμνω.) The act of making an incision into the wind-pipe, used when some tumour in the throat hinders respiration.

PHARYNX. (φαρυγξ απο τη φεραν, because it conveys the food into the stomach.) The muscular bag at the back part of the mouth. It is shaped like a funnel, adheres to the fauces behind the larynx, and terminates in the œsophagus. Its use is to receive the masticated food, and to convey it into the œsophagus. See **ANATOMY**.

PHARZA, anciently **PHARSALIA**, a town of Turkey in Europe, in Jauna, famous for the decisive victory gained by Julius Cæsar over Pompey, in 48 B. C. This town is an archiepiscopal see, and seated on the Enipeus, a few miles S. of Larissa.

PHASCUM, in botany, a genus of the class cryptogamia, order musci. Capsule ovate, every-where closed, or with the mere rudiment of a lid, not opening. Sixteen species, all indigenous mosses.

PHASEOLUS. Kidney-bean. In botany, a genus of the class diadelphia, order decandria. Keel with the stamens and style spirally twisted. Twenty-four species; natives of the East or West Indies, America, or the Cape: of which some are climbing, some erect. Of these *P. vulgaris*, or common kidney-bean, is that chiefly cultivated in our own country. Stem twining; raceme solitary, shorter than the leaves; peduncles in pairs; bractes less than the calyx,

spreading; legumes pendulous. A native of India.

The varieties produced and still continued from this species are very numerous; the following are those most in repute:

1. The common white or Dutch kidney-bean.
2. The smaller kidney-bean, commonly called the Battersea kidney-bean. And, 3. The upright sort, called the tree kidney-bean. The first sort was sometime ago greatly propagated in England, and is still in Holland: it grows very tall, and requires long stakes and poles to climb on, and its beans are considerably broad; this makes them less saleable in the markets, people supposing them to be old because they are broad; and they are hence grown into disuse, though a much more valuable kind for eating than any other. The second sort, or Battersea bean, is what is more universally cultivated; it never grows very tall nor rambles far, and the air can easily pass between the rows, because of its moderate growth; and this makes it bear plentifully and ripen well for table. It is the best tasted bean, except the preceding. The third, or tree kidney-bean, is also a plentiful bearer and never rambles, but grows up in form of a shrub: its beans are broader than the Battersea kind, and are not so well tasted. They are all propagated from seeds, which are to be put into the ground in the latter end of March, or beginning of April, for an early crop, but these should have a warm situation and a dry soil; they must also be planted in a dry season. The manner of planting them is to draw lines with a hoe over the bed, at two feet and a half distance, into which the seeds are to be dropped at about two inches asunder, and the earth is to be drawn over them with the head of a rake, to cover them about an inch deep. In a week after sowing, the plants will appear, and the earth should be drawn up about their stalks as they rise up; for a few days after this, they will require no farther care, except to be kept clear from weeds, and when the beans appear, to have them gathered twice a week; for if the beans are suffered to hang on too long they not only become of no value, but they weaken the plant. The first crop of kidney-beans will continue a month in good order; and to supply the table afterwards, there should be fresh sowing in March, April, May, and June, the last of which will continue till the frosts come to destroy them. Some raise their early crops on hot-beds; and this is to be done exactly in the same manner as the raising the early cucumbers.

PHASES, in astronomy, from the Greek word φαινω, to appear: the several appearances or quantities of illumination of the Moon, Venus, Mercury, and the other planets. See **ASTRONOMY**.

PHASIANUS. Pheasant. Cock and hen. Bill short, strong; cheeks covered with a smooth, naked skin; legs generally with spurs. Fifteen species; scattered over the globe. The following are the chief;

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1. *P. gallus*. Cock and hen. This species embraces fifteen varieties.

a. Wild cock. Comb on the crown and two wattles on the chin compressed; ears naked; tail compressed, erect; feathers of the neck linear, long, membranaceous at the tips.

c. Common cock. Comb on the crown, and two wattles on the chin compressed; ears naked; tail compressed, erect; feathers of the neck linear, long.

γ. Crested cock. Crown with a thick downy crest.

δ. Darking cock. Feet five-toed, two behind.

ε. Frizzled cock. All the feathers turned back.

ξ. Persian cock. No rump or tail-feathers.

η. Dwarf cock. Legs very short.

θ. Bantam cock. Shanks feathered; the feathers behind long.

ι. Rough-legged cock. Legs feathered down to the toes.

κ. Turkish cock. Variegated with beautiful colours.

λ. Paduan cock. Body twice as large.

μ. Negro cock. Chest, wattles, and chin black.

ν. Crowned hen. Hen with crown tuberos.

ξ. Horned cock. Crown horned.

ζ. Silk cock. Feathers resembling hairs.

The cock and hen came originally from Asia, perhaps from Persia. Aristophanes calls the cock the Persian bird. The period in which they were transported from that kingdom to the western parts of Europe is so remote, that it is beyond the reach of all authentic history. We know, from the sacred records, that they were common, in a domestic state, in Judæa. Cæsar mentions them in Britain, at a still earlier period, among the articles of food, which the rude natives were prohibited from eating, by the institutions of the Druids. But though poultry were early spread, from China, over the whole of the ancient continent, as far as the Cape Verd islands, and even Iceland, there is reason to believe, that they were unknown in America, till its conquest by the Europeans. They were thirty years introduced into Peru, before they became accustomed to breed there; and it is asserted, that, for some time after they were introduced into Brasil by the Spaniards, the Indians were so little acquainted with them, that they deemed their eggs impure and poisonous.

The male and female of this species are extremely different in their outward appearance. The comb, wattles, neck, tail, and spurs, all sufficiently characterize the cock. The hen has less brilliancy of colour, and, in her manners, less gravity, fierceness, and pride. There are some hens, indeed, whose sex seems ambiguous; who have spurs upon their legs, and a comb upon their head, resembling those of the cock; and who endeavour, according to Aristotle, to imitate him in things still more essential. These may be regarded as herma-

phrodites, without sex, and depraved even in the common and essential organs of the species, since they are incapable of perpetuating it. The hen is, in general, more slender in all her proportions than the cock; her legs are shorter; but her apparent bulk is increased by a larger quantity of feathers.

The cock and hen, that are so perfectly familiar to us in their domestic state, are so seldom found in their natural freedom, that mankind seem to have forgotten their manners and form in that condition. Even in Persia, their native country, they are not now found wild; and had they not been seen by some travellers since the advancement of commerce and navigation, their primitive appearance, like that of the wild sheep, would have been unknown. In the kingdom of Congo, the island of Tinian, and the Philippines, the poultry are still found in their ancient state of independence. There, the plumage of the cock is black and yellow; his comb and wattles are yellow and purple. There are some found in the Indian woods, that have this farther peculiarity, that their bones, when boiled, are as black as ebony; a circumstance which arises, probably, from some particular food which may communicate that tincture, as madder, with us, is known to dye them red.

The common hen is perhaps the most fertile of all birds. Excepting the space of about two months in the moulting season, she frequently lays an egg every day, especially if kept sufficiently warm, and well fed. When in her wild state, she generally begins to hatch after laying fifteen or sixteen; and it is only from the circumstance of abstracting her eggs, that she produces a greater number when tame. Many other birds are capable of making a similar effort, to regain the usual number of their eggs, when by any accident these have been destroyed. Although of all mothers the most careful of her offspring, the hen is not capable of rearing much above a dozen of chicks. The size of her body will not communicate heat to a greater number of eggs, nor afford sufficient shelter and warmth to a more numerous brood, when hatched. To remedy this defect, and avail themselves more completely of her fertility, many contrivances have been suggested by the ingenious. It has been found, that any kind of heat may be substituted for that created by the body of the hen: hence the invention of stoves, by which not only the whole produce of the hen, but several thousands of eggs, may be hatched at once. In the warm climate of Egypt, where the young need no shelter or clucking after they are excluded from the shell, immense numbers can be reared in this manner; and the scheme is practised to a considerable extent. In our colder and more variable climate, the young may indeed, without much difficulty, be hatched; but without the warmth and shelter of the mother, they must soon perish, after being excluded. To remedy this, an ingenious French naturalist has suggested the use of a woollen hen, or false mother;

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which is nothing more than applying over them a warm canopy of thick woollen cloth: and this plan has lately been improved upon by several breeders in our own country.

But a much more natural and advantageous substitute for the care of the mother has been found, in training the capon to cluck young; an office which he soon learns to perform with affection and assiduity, and, from the greater size of his body, with more success than the hen herself. All that is necessary for this purpose is, to confine him for some time in a dark coop, bringing him out to feed, at stated times, with a number of chickens already considerably advanced. By degrees, he will thus become fond of their society, and will allow them regularly to enjoy the shelter and warmth of his body. The hen, thus relieved of her charge, will again soon resume the business of laying, and preparing a second family, and the capon, condemned to sterility, will still contribute, although indirectly, to the multiplication of his species.

The extraordinary courage of the cock is universally known in almost every country, which has been already noticed. The custom of making them fight, and of turning into an amusement the invincible hatred, which nature has planted in the individuals of this species against each other, is a practice very ancient. The innate ferocity of these animals has been cultivated and increased with so much art, that the combats of the poultry yard have been deemed an interesting spectacle, even among polished nations. The Athenians and Rhodians were anciently much addicted to this irrational and barbarous amusement. Among the former, a particular day was annually consecrated to the amusement of cock-fighting. Ælian gives the following account of the origin of that custom. When Themistocles took the field to engage the Persians, he observed a timidity among his soldiers; and, among the various topics to which he had recourse to animate them, he mentioned the invincible courage of the cock. "Observe," said he, "with what intrepid valour he fights, while he has no motive but victory to impel him: while you have to contend for your religion and your liberty, for your wives and children, and for the tombs of your ancestors." This harangue, which, to a modern army, would appear ludicrous, is said to have inspired such courage into the Athenian soldiers, that they obtained a triumph, the most memorable which history records. It was in commemoration of this celebrated event that the Athenians instituted the annual games of cock-fighting.

The Rhodians were still more addicted to this practice. Their cocks were larger, stronger, and much more ferocious in battle, than the common kind; while the sexual passion was in them less frequent, and less ardent; and their hens, it is said, were also much less prolific. This seeming contrariety to the common laws of nature probably arose from their education. Being continually accustomed to ferocity and

rage, the softer passion was choked or weakened, although it was the original source of their courage, and the foundation of their warlike habits.

At present, cock-fighting is keenly pursued in China, in the Philippine isles, in Java, and in the isthmus of Darien. In Europe, the passion for this amusement has long been on the decline: still, however, there are many countries which pursue it with avidity; and in which the spectators interest themselves so deeply in the issue of the battle, that, in the language of Buffon, the fate of families is often determined by the last stroke of the victorious bird. If the ancient Romans were trained to ferocity by the bloody spectacles exhibited in the Campus Martius, by the gladiators, we should imagine that the practice of cock-fighting would be still more pernicious to the morals of nations, by adding habits of gambling to those of cruelty. See **COCK-FIGHT**.

The cock is the most salacious of all birds. His jealousy and courage seem to be the natural result of his salacity. One cock suffices for a dozen or fifteen hens: but, although surrounded by a numerous train of females, his jealousy is always in proportion to the force of his sexual appetite. The common poultry, which we continually employ in propagating their kind, probably soon exhaust the principles of life; and, therefore, in their domestic state, are not long-lived. As it is by mere accident, however, that any of them are allowed to reach the period assigned them by nature, and to die of old age, we are not able to ascertain exactly their longevity. Buffon supposes, that, in their domestic state, they may live twenty years, and, in their natural freedom, perhaps ten more.

In proportion as they are removed from their native country, and are habituated to different food and climate, all the poultry tribes undergo a change in their external appearance, and even in their size. From this cause arise all the endless varieties and sub-varieties described by different naturalists in colour and size. In all these varieties, however, the cock is distinguished by the characteristics of being very courageous, proud, watchful, and salacious: he claps his wings before he sings or crows; has a piercing sight, and never fails to cry in a peculiar note at the sight of a bird of prey. The common length is three feet four inches: feeds on grains and worms, which the hen shows to her chickens by scraping on the ground. The hen to lay the whole year requires plenty of water, food, and gravel, and a warm nest. After laying an egg she makes a loud clucking, which is answered by all the hens within hearing: she will not sit if she be immersed in cold water: she is hurt by elder-berries, and subject to lice, which, however, are destroyed by pepper.

2. *P. Mexicanus*. Courier pheasant. Tawny-white; tail long, shining green. Inhabits New Spain: eighteen inches long; slow in flight, but so swift on foot as to out run the fleetest horses.

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3. *P. cristatus*. Crested pheasant. Above brown, beneath reddish-white; vent rufous; head crested; orbits naked, red; tail wedged, tip with yellow. Inhabits New Spain: twenty-two inches long; frequents trees growing near the water; and feeds on serpents, worms, and insects.

4. *P. colchicus*. This species is the pheasant, properly so called, and comprises the following varieties:

a. Common pheasant. Rufous; head blue; tail wedged; cheeks papillous.

c. Ringed pheasant. Collar white.

γ. Variegated pheasant. White varied with rufous.

δ. White pheasant. White, with a few small black spots on the neck and rufous ones on the shoulders.

ε. Pied pheasant. Above rufous varied with brown and whitish; tail-feathers black edged with white.

ζ. Turkey pheasant. Orbits naked, red; rest of the head feathered.

Inhabits Africa and Asia; from two to three feet long; is domesticated every where; in breeding time above the ears on each side is a golden-feathered tuft like a horn.

5. *P. superbus*. Superb, or golden Chinese pheasant. Unarmed; rufous, varied with green and blue; caruncles of the front rounded; wattles subulate; bill and body red; crown green, the hind-part with a folding blue crest. By some naturalists regarded as a mere variety of *P. colchicus*. Inhabits China.

The pheasant, which, as we have just observed, is a native of Asia, is still farther traced by all the naturalists to Colchis or Mingrelia; whence it is said to have been brought down the river Phasis, into Greece, by the Argonauts, in their expedition in quest of the golden fleece. This fact, too remote to be well authenticated, is received on the testimony of Martial.

*Argivæ primum sum transportata carinæ;
Antè mihi notum nil, nisi phasis, erat.*

The pheasants of that country are still remarked to be the largest and most beautiful: hence, it probably was their original habitation, from which they have gradually spread, in succeeding ages, over the greatest part of the ancient continent. In Great Britain, and the northern parts of France, they are still rare. In Sweden, the severity of the climate has altogether prevented their propagation; though they have been lately introduced into Prussia and Silesia.

From its large size, and the shortness of its wings, the pheasant is necessarily a bird of heavy flight. Of course, it has never been able to cross those broad seas, which, in the warm latitudes, separate the old from the new continent, and to fly over to America. It has, however, been long reared in St. Domingo, by the Spaniards, who carried the breed from Europe.

Of all birds, except the peacock, the pheasant has the most beautiful and finely variegat-

ed plumage. The superb or golden China pheasant is said even to vie with that splendid bird, in the richness of its colours; but the whole race wants the power of raising and expanding the feathers of the tail, and also that slender form and those elegant proportions which so much enhance the charms of the peacock. The hen pheasant has not the same lustre as the male, whose plumage, though of a dark ground, shines with all the different reflections of gold, purple, and violet; varying constantly, according to the different points from which it is viewed. The rich lustre of the feathers of this bird depends upon their union and position with regard to each other; for a single feather, taken separately, appears only brown or black; the glossy shades of green and yellow disappearing.

The several varieties of the pheasant are occasioned partly by climate and partly by domestication. The white pheasant is, probably, a variety occasioned by the cold, if we may judge from the effects of climate on other animals. The spotted and the variegated pheasants are supposed to be a mixed race, arising from the union of the common species with the white; as the bastard pheasant is allowed to be the offspring of the pheasant and common hen, produced by domesticating the former in the poultry yard. The golden pheasant of China, the most beautiful of this genus, may be regarded rather as a variety than a different species. Buffon alleges, that these varieties are branches of the same original family, which, after a long separation, are still capable of forming alliances, and producing an offspring. The singular beauty of the golden pheasant has introduced it into the pheasantries of many parts of Europe, where successful attempts have been made to make it breed with our own. The prevailing colours of its plumage are red, yellow, and blue; and it is distinguished by a beautiful crest upon the head, which it raises at pleasure. The iris, the bill, and the legs, are yellow. The tail is longer, and more exquisitely enamelled, than that of the European species: above it, there proceed a number of long, straight feathers, of a scarlet hue, mixed with yellow; ornaments, for which it seems indebted to the influence of a milder and more serene sky.

The pheasants, in their wild state, feed, like the rest of the gallinaceous tribes, upon all kinds of grain and herbage. When young, they are very difficult to be reared; because they must then be supplied with ants-eggs, which constitute the food, to which, when wild and young, they are accustomed. Woodlice, earwigs, and other insects, are collected by those who rear them in order to vary their nourishment. From their extraordinary size, their beauty, and the delicacy of their flesh, they are every where considered by the sportsman as excellent game. There is, accordingly, no bird upon which such pains have been taken in its propagation, in parks and pheasantries: there is none, however, upon which the influ-

ence of domestication has been so inconsiderable. So wild are they by nature, that, even where they depend on man for support, they continually fly at his approach. They even avoid one another; for it is only in the months of March and April that the male and female associate together. They are then frequently discovered in the woods, by the noise which the male occasions by clapping his wings. When started, they make a whirring like the partridge, which warns the sportsman; and being a large mark, and flying very slow, there is no difficulty, even to an inexperienced shooter, to bring them to the ground.

The hen pheasant constructs her nest without the aid of her mate; and, generally, in the most secret and inaccessible corner of the forest. It is apparently a careless fabric of leaves and withered grass: when, however, supplied with a nest carefully built of these materials, she is never satisfied till it be new-modelled from the foundation, after her own manner. The number of her eggs is various, according to the climate, and her means of subsistence. She lays from a dozen to twenty; but when they are carried away, she continues, like the common hen, her vain efforts to fill the nest. After she has done breeding, she puts on the appearance of the male.

6. *P. argus*. Argus pheasant. Pale yellow spotted with black; face red; hind-head crested, blue; front, chin and throat, red; crested hind-head and nape blue; wings grey with eye-like spots; tail wedged, the colour of the wings, the two middle feathers three feet long, with large eye-spots at the shaft; feet armed. Inhabits Chinese Tartary, and is as large as a turkey. See Nat. Hist. Pl. CLXVII.

PHASIS. *s.* In the plural *phases*. (φάσις; *phase*, Fr.) Appearance exhibited by any body: as the changes of the moon (*Creech*).

PHASIS, a river of Colchis rising in the mountains of Armenia. It is famous for the expedition of the Argonauts, who entered it, after a perilous voyage. There were on its banks a number of large birds, of which the Argonauts brought some to Greece, and which were called on that account pheasants. The Phasis was reckoned by the ancients one of the largest rivers of Asia.

PHASM. *s.* (φάσμα.) Appearance; phantom; fancied apparition (*Hammond*).

PHASMATA, in physiology, certain appearances arising from the various tinctures of the clouds by the rays of the heavenly bodies, especially the sun and moon. These are infinitely diversified by the different figures and situations of the clouds, and the appulses of the rays of light; and, together with the occasional flashings and shootings of different meteors, they have, no doubt, occasioned those prodigies of armies fighting in the air, &c. of which we have such frequent accounts in most sorts of writers. — See 2 Maccab. xi. 8. Melaneth. Meteor. 2 Shel. de Comet. ann. 1618.

PHAYLOPSIS, in botany, a genus of the class didynamia, order angiosperma. Calyx

five-cleft, the upper division larger; corol ringent, the upper lip very small and cloven; capsule one-celled, four-seeded, silique-shaped. One species, an East Indian plant.

PHEASANT, in ornithology. See PHASIANUS.

PHEASANT'S EYE, in botany. See ADONIS and DIANTHUS.

PHEASANT-POUTS. Young pheasants; for the driving and taking of which within nets, when you have found out an eye of them, place your nets cross the little paths and ways they have made, which are much like sheep tracks; and, if possible, you should find out one of their principal haunts, which may be easily known by the barrenness of the ground, their mutings, and the feathers which lie scattered about; and always take the wind with you, for it is their custom to run down the wind; place the nets hollow, loose, and circular-wise; the nether part must be fastened to the ground, and the upper side lie hollow, so that when any thing rushes in, it may fall and entangle it.

Having so fixed the net, go to the haunts, and if you find the eyes scattered, with your call draw them together, and when you find them begin to cluck and pipe to one another, then forbear calling, and take an instrument, by some called a driver; which is made of strong white wands, or osiers, such as basket-makers use, which must be set in a handle: in two or three places it must be twisted or bound about with small osiers, according to the figure. With this driver, as soon as you see the pheasants gathered together, make a great noise on the boughs and bushes about you, which will so frighten them, that they will all get close together, and run away a little distance, and stand to hearken; then make the same noise a second time, which will make them run again, and continue the same till you have driven them into your nets, for they may be driven like sheep; but if it happens that they take a contrary way, then make a croaking noise, as it were, in their faces, which will presently turn them the right way, as you would have them; but in using the driver, first observe secrecy, in keeping yourself out of their sight, for if they espy you, they will run and hide themselves in holes, under shrubs, and will not stir till night. Secondly, take time and leisure, for rashness and over-haste spoil the sport.

PHEASANT-SHOOTING. This is now the only method (as hawking is disused) by which pheasants are taken by the fair sportsman. See the article SHOOTING.

PHEASANT-TAKING; a rural diversion, performed with nets in the crowing time, which is about the end of February, and in March, before they begin to breed; but which is rather the employment of the poacher than of the fair sportsman. It is done either generally or particularly; the first is, when the whole eye, viz. the old cock and hen, with all their young ones, or pouts, as they flock or run together in thick woods or coppices, are taken; or

Phasianus.

Metacalla Sutoria.

Sailor-Bird.

P. Argus.



particularly, when none but the old, and such of the young as are of age fit for coupling, are taken; so that you cannot have any assurance with your nets to strike at more than one or two at a time; for the pheasant is of a melancholy, sullen disposition, and when once it has coupled, does not accompany in flocks as other birds.

In order to take pheasants with the greater ease, you must be acquainted with their haunts and usual breeding-places, which are in young, thick, and well-grown coppices, free from the annoyance of cattle or path-ways; for being of a very timorous nature, they esteem the strength of their covert their only safety, and do not abide or breed in open or plain fields, nor under the covert of corn fields, low shrubby bushes, or in large and tall trees.

Having found their haunts, next find their eye, or brood; and here you are to observe, that pheasants come out of the woods and coverts thrice a day, to feed in fresh pastures, green wheat, or other grain, and that is about sun-rising, about noon, and a little before sun-set. Now the course to be followed, is to go to that side of the wood where you suppose they make their sallies, and watch the places where they come out; or by searching their haunts you may see the young pouts in that season flock and run together after the hen like chickens. Again, if you go to their haunts early in the morning or late in the evening, you will hear the old cock and hen call their young ones, and the young ones answer them, and accordingly direct your path as near as you can to the place where they are, then lie down as close as possible, that you may not be discerned; but observe especially how they lodge together, the better to know how to pitch your nets with the greater advantage, both of wind, weather, and place; and take care that all be done as silently as possible, otherwise they will betake themselves to their legs, and not to their wings, unless forced to it by a close pursuit.

But the most certain way to find them out, is to have an artificial pheasant-call, in using which a person should be very expert in the imitation of their notes, and the time when, and to what purpose they use them, which calls are much the same as hens use in clucking their chickens.

The chief time for using the call is in the morning early, or about sun-set, at which time they seek their food, and then the note must be to call them to food; but though these are the best times, yet the call may be used at other times, only altering the notes for calling them together, or the like.

Having the perfect use of the call, the knowledge of their haunts, and the times to take them, choose some private place not to be discovered, and then call at first very softly, lest they should be lodged very near you, and be affrighted at your loud note; but if nothing reply, raise your note higher and higher till it be extended to the utmost compass, and if any

be within hearing they will answer in as loud a note as yours, provided it be tunable, but if otherwise it will be spoiled.

As soon as the pheasant answers, if she be at much distance, creep nearer and nearer, still calling, but not so loud; and as you advance, so will the pheasant to you, so that you will come in sight of her, either on the ground or at perch, always imitating her in her true note; then cease calling, and spread your net between the pheasant and yourself in the most convenient place you can find, making one end of the net fast to the ground, and holding the other in your hand by a long line, so that when any thing strains it, you may pull the net close together; which done, call again, and as soon as you perceive the pheasant come under your net, rise up and shew yourself, upon which being affrighted, she will spring, and become entangled in the net.

If you have various pheasants answer the call, and that from several parts of the wood, keep your first station, and as you hear them make towards you, get your nets ready, spreading them conveniently about you, viz. one pair of nets on one side and another on the other, lying close without any noise, except your call, till you have lured them under your nets, and then stand up to affright them as above, that they may be entangled in your nets.

Another way to take pheasants, and which is reckoned much better than the former, is, to be provided with a stale or decoy pheasant, a live cock, which must be secretly tied down to your net, and which by his crowing will draw others in: you must lie concealed in some bush or secret place, and when you see any pheasant come to your net, draw your line, and the net will fall on and enclose him.

To take pheasants by snares.—When you have found their passage out of the wood to their usual places of feeding, plant a little stake, with a couple of snares of horse-hair, one to lie flat on the ground for their feet, and the other about the height of their head, to take them by the neck; and if there should be more passes than one do the like to every one of them; then fetch a compass about, and when you are in a direct line with the pheasant and the snare that you have fitted, make a gentle noise to frighten them.

If by their dunging and scraping you perceive that they frequent any particular place, you may then make use of such hedge-rows as are directed to take birds with lines and bird-lime, only plant your running-lines from them of a convenient height, and still place one to lie flat to entangle their legs.

Pheasants were also formerly taken by employing trained goshawks, which mode of sporting was denominated PHEASANT-HAWKING; but the diversion has been long laid aside.

PHEBE, a deaconess of the port of Corinth, called Cenchrea. St. Paul had a particular esteem for this holy woman; and Theodoret thinks the apostle lodged at her house for some

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time, while he continued in or near Corinth. It is thought she brought to Rome the epistle he wrote to the Romans, wherein she is commended and recommended in so advantageous a manner. He says (Rom. xvi. 1, 2.), "I commend unto you Phebe our sister, which is a servant of the church which is at Cenchrea; that ye receive her in the Lord, as becometh saints, and that ye assist her in whatsoever business she hath need of you; for she hath been a succourer of many, and of myself also." Some moderns have advanced a notion, that Phebe was wife to St. Paul; but none of the ancients have said any thing like it. It is thought, in quality of deaconess, she was employed by the church in some ministrations suitable to her sex and condition; as to visit and instruct the Christian women, to attend them in their sickness, and distribute alms to them.

PHEER. *s.* A companion. See **FEER** (*Spenser*).

To PHEESE. *v. a.* (perhaps to *feaze*.) To comb; to fleece; to curry (*Shakspeare*).

PHEGEUS, or **PHLEGEUS**, a priest of Bacchus, the father of Alpheisibœa, who purified Alcæon of his mother's murder, and gave him his daughter in marriage. He was afterwards put to death by the children of Alcæon by Callirhoe, because he had ordered Alcæon to be killed when he attempted to recover a collar, which he had given to his daughter.

PHEGOR, or **PEOR**, a deity worshipped at a very early period by the Midianites and Moabites, and probably by all the other tribes which then inhabited Syria. Much has been said concerning the functions of this god, and the rank which he held among the Pagan divinities (see **BAAL-PEOR**); and many conjectures have been formed concerning the origin of his name. Most of these seem to have no better foundation than the senseless dreams of the Jewish rabbis. Phegor, or Peor, is undoubtedly the same with the Hebrew word *pechor*, which signifies *aperuit*, and probably refers to the prophetic influence always attributed to the solar deity, by which he opened or discovered things to come. Accordingly we find Phegor or Peor generally joined to Baal, which was the Syrian and Chaldean name of the Sun after he became an object of worship; hence Baal-Phegor must have been the sun worshipped by some particular rites, or under some particular character.

PHELLANDRIUM. Water hemlock. In botany, a genus of the class pentandria, order digynia. Florets all fertile; the central ones less; fruit ovate, smooth, crowned with the calyx and styles. Two species, one of which is common to our own ditches, the other to the European continent. The former, *P. aquaticum*, has the ramifications of its leaves divaricate, its stalk thick, and dichotomous. It proves poisonous to horses; but whether from its own juice, or the secretion of an insect, the *curculio paraplecticus*, which feeds upon it

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and breeds within its stalk, is not decided. Linnæus inclines to the last opinion.

PHENGITIS. See **AMETHYST**.

PHENICE, a port of the island of Crete, to the west of the island. St. Paul having anchored at Phenice, when he was carried to Rome (Acts xxvii. 12.), advised the ship's crew to spend the winter there, because the season was too far advanced.

PHENICIA. See **PHENICIA**.

PHEONS, in heraldry, the barbed heads of darts, arrows, or other weapons.

PHENOMENON. *s.* (φαινόμενον; *phenomene*, French: it is often written *phenomenon*, and when used as a Greek plural, *phenomena*, should always be spelt with the *æ*.) 1. Appearance; visible quality (*Burnet*). 2. Any thing that strikes by any new appearance.

PHERECRATES, a comic poet of Athens, in the age of Plato and Aristophanes. He introduced living characters on the stage, and invented a sort of verse, which from him has been called Pherecratian, consisting of the three last feet of an hexameter verse, of which the first was always a spondee, as for instance, the third verse of Horace's 1, *od. 5*.

PHERECYDES. The most celebrated of this name is a philosopher of Scyros, disciple to Pittacus. He was acquainted with the periods of the moon, and foretold eclipses with the greatest accuracy. The doctrine of the immortality of the soul was first supported by him, as also that of the metempsychosis. Pythagoras was one of his disciples, remarkable for his esteem and his attachment to his learned master. He died B. C. 515, in the 85th year of his age.

PHERES, a son of Cretheus and Tyro, who built Phæræ in Thessaly, where he reigned. —2. A son of Medea, stoned to death by the Corinthians on account of the poisonous clothes which he had given to Glauce, Creon's daughter. (*Paus*).

PHERETIMA, the wife of Battus, king of Cyrene, and the mother of Arcesilaus. After her son's death, she recovered the kingdom by means of Amasis king of Egypt, and to avenge the murder of Arcesilaus, she caused all his assassins to be crucified round the walls of Cyrene, and she cut off the breasts of their wives, and hung them up near the bodies of their husbands. It is said that she was devoured alive by worms.

PHIAL, a well known vessel made of glass, used for various purposes.

PHIAL (Leyden), is a phial of glass coated on both sides with tin-foil for a considerable way up the sides, of great use in electrical experiments. See **ELECTRICITY**.

PHIDIAS, the most famous sculptor of antiquity, was an Athenian, and a contemporary of the celebrated Pericles, who flourished in the 83d Olympiad. This wonderful artist was not only consummate in the use of his tools, but accomplished in those sciences and branches of knowledge which belong to his profession, as history, poetry, fable, geometry, optics, &c.

He first taught the Greeks to imitate nature perfectly in this way; and all his works were received with admiration. They were also incredibly numerous; for it was almost peculiar to Phidias, that he united the greatest facility with the greatest perfection. His Nemesis was ranked among his first pieces: it was carved out of a block of marble, which was found in the camp of the Persians after they were defeated in the plains of Marathon. He made an excellent statue of Minerva for the Plateaus; but the statue of this goddess in her magnificent temple at Athens, of which there are still some ruined remains, was an astonishing production of human art. Pericles, who had the care of this pompous edifice, gave orders to Phidias, whose prodigious talents he well knew, to make a statue of the goddess; and Phidias formed a figure of ivory and gold 39 feet high. Writers never speak of this illustrious monument of skill without raptures; yet what has rendered the name of the artist immortal, proved at that time his ruin. He had carved upon the shield of the goddess his own portrait and that of Pericles; and this was, by those that envied them, made a crime in Phidias. He was also charged with embezzling part of the materials which were designed for the statue. Upon this he withdrew to Elis, and revenged himself upon the ungrateful Athenians, by making for the Elians the Olympic Jupiter; a prodigy of art, and which was afterwards ranked among the seven wonders of the world. It was of ivory and gold; 60 feet high, and every way proportioned. "The majesty of the work did equal the majesty of the god (says Quintilian), and its beauty seems to have added lustre to the religion of the country." Phidias concluded his labours with this masterpiece: and the Elians, to do honour to his memory, erected, and appropriated to his descendants, an office, which consisted in keeping clean this magnificent image.

The remains of the statue of the Eleusinian Ceres were purchased by Dr. E. D. Clarke and Mr. Cripps, two travelling fellows of Jesus college, Cambridge, and after being removed at considerable labour and expence, from Greece to England, are now fixed in the public library of that university.

PHIDIPIDES, a celebrated courier, who ran from Athens to Lacedæmon, about 152 English miles in two days, to ask of the Lacedæmonians assistance against the Persians. The Athenians raised a temple to his memory.

PHIDITIA, a public entertainment at Sparta, instituted by Lycurgus the legislator, where much frugality was observed, as the word (*φιδίτις* from *φιδίμαι* *πειρο*) denotes. It was a school of temperance and sobriety, where the youth were trained to good manners and useful knowledge, by the example and the discourse of the elders.

PHILA, in mythology, one of the attributes of Venus, which distinguishes her as the mother of love, from *φιλία*, to love.

PHILADELPHIA, in antiquity, were games instituted at Sardis to celebrate the

union of Caracalla and Geta, the sons of Septimius Severus.

PHILADELPHIA, in ancient geography, a noted city of Mysia, or Lydia, at the N. foot of mount Imolus, distant about 24 miles E. of Sardis, and 72 from Smyrna. A christian church was very early established here, to which John was directed to write one of the seven epistles. See Rev. iii. 7—13. This was the last city in those parts which submitted to the Turks, after a dreadful siege of six years. The Greeks retain its ancient name, but the Turks call it Allahijah. It contains 11000 inhabitants, among whom are 2000 Christians, who have four churches, and a Greek archbishop. It is 40 miles E.S.E. of Smyrna. Lon. 28. 15 E. Lat. 38. 28 N

PHILADELPHIA, the capital of Pennsylvania, and formerly the metropolis of the United States of America. It is situate in an extensive plain, on the W. bank of the river Delaware. The length of the city from E. to W. that is, from the Delaware to the Schuylkill, upon the original plan of Mr. Penn. is 10,300 feet, and the breadth, N. and S. is 4837 feet. Not half of the plot covered by the city charter is yet built. The inhabitants, however, have not confined themselves within the original limits of the city, but have built N. and S. along the Delaware, two miles in length. The circumference of the part which is built, including Kensington on the N. and Southwark on the S. is about five miles. Market Street is 100 feet wide, and runs the whole length of the city from river to river; and, near the middle, it is intersected at right angles by Broad Street, 113 feet wide, running nearly N. and S. The other streets are 50 feet wide, except Arch Street which is 65 feet, and they intersect each other at right angles. There are four squares of eight acres each, one at each corner of the city, originally reserved for public uses, and a square of ten acres in the centre. It is governed by a mayor, has 26 places of public worship for Christians of various denominations, and a synagogue for the Jews. The statehouse is a magnificent building; on the left of which is a city court-house, and on the right a philosophical hall. Here likewise is a county court-house, a public library, and several other public buildings. A university was incorporated here in 1791; its funds partly given by the state, and partly taken from the old college. This city was visited by a malignant fever in August 1793, which, in the course of three months, carried off nearly 5000 of the inhabitants. It contained 70,000 inhabitants in 1802. It is 97 miles S.W. of New York, and 130 N.E. of Washington, the present metropolis. Lon. 75. 8 W. Lat. 39. 57 N.

PHILADELPHUS, the surname of one of the Ptolemies, king of Egypt, by Antiphrasis, because he destroyed all his brothers. (See PTOLEMÆUS, 2d.)

PHILADELPHUS. Mock-orange. *Syringa*. In botany, a genus of the class icosandria, order monogynia. Calyx four or five-parted,

superior; petals four or five; style four-cleft; capsule four or five-celled, many-seeded. Two species.

1. *P. coronarius*. White syringa. Long cultivated in the gardens of our own country, and introduced from the South of Europe. Leaves slightly toothed, rough, opposite, tasting like cucumbers.

2. *P. inodorus*. Carolina syringa. Leaves very entire; flowers large, white, inodorous: a native of North America. Both these sorts are easily propagable by layers, cuttings, or suckers.

PHILÆNI, two brothers of Carthage. When a contest arose between the Cyreneans and Carthaginians, about the extent of their territories, it was mutually agreed, that, at a stated hour, two men should depart from each city, and that whenever they met, there they should fix the boundaries of their country. The Philæni accordingly departed from Carthage, and met the Cyreneans, when they had advanced far into their territories. This produced a quarrel, and the Cyreneans supported that the Philæni had left Carthage before the appointment, and that therefore they must retire, or be buried in the sand. The Philæni refused, upon which they were overpowered by the Cyreneans, and accordingly buried in the sand. The Carthaginians, to commemorate this patriotic deed of the Philæni, raised two altars on the place where their bodies had been buried, which they called *Philænorum aræ*. These altars were on that side the boundaries of the Carthaginian dominions.

PHILANTHROPY. *s.* (φιλεω and ανθρωπος.) Love of mankind; good-nature (*Addison*).

PHILANTHUS, in the entomology of Fabricius, a tribe of the genus *vespa* or wasp. See **VESPA**.

PHILEMON, a Greek comic poet, was son to Damon, and cotemporary with Menander. Any advantage he had over this poet, was owing less to his own merit than to the intrigues of his friends. Plautus has imitated his comedy *du Marchand*. He is reported to have died laughing on seeing his ass eat figs. He was then about 97 years of age. His son, Philemon the younger, was also the author of 54 comedies, of which there are still extant some considerable fragments collected by Grotius. These clearly prove that he was not a poet of the first rank. He flourished about the year 274 before our Saviour.

PHILEMON, was a rich citizen of Colossæ in Phrygia. He was converted to the Christian faith, with Appia his wife, by Epaphras the disciple of St. Paul; for St. Paul himself did not preach at Colossæ. Coloss. ii. 1: Perhaps we should have known nothing of St. Philemon, had it not been on the account of his slave Onesimus, who having robbed him, and run away from him, came to Rome, where he found St. Paul, and was very serviceable to him. St. Paul converted him, baptized him, and sent him back to his master Philemon; to whom he wrote a letter still extant, and

which passes for a masterpiece of that kind of eloquence, natural, lively, strong, and pathetic, that was peculiar to St. Paul. See **EPISTLE**. Philemon (1, 2.) had made a church of his house, and all his domestics, as well as himself, were of the household of faith. His charity, liberality, and compassion were a sure refuge to all that were in distress. The Apostolic Constitutions say, that St. Paul made him bishop of Colossæ; but the Menææ insinuate, that he went to Gaza in Palestine, of which he was the apostle and first bishop. From thence he returned to Colossæ, where he suffered martyrdom with Appia his wife, in the time of Nero. They relate several particulars of his martyrdom, and say, that his body remained at Colossæ, where it performed several miracles.

PHILESIA, in botany, a genus of the class hexandria, order monogynia. Calyx-less; corol six-petalled; the three inner petals twice as long; stigma three-lobed; berry superior, many-seeded. One species; a shrub of the Straits of Magellan, with large, axillary, campanulate corol.

PHILESIUS, a leader of the 10,000 Greeks after the battle of Cunaxa.

PHILETÆRUS. The most celebrated of this name is an eunuch made governor of Pergamus by Lysimachus, with whom he quarrelled, and made himself master of Pergamus, where he founded a kingdom called Pergamus, B. C. 283. He reigned there for 20 years, and at his death he appointed his nephew Eumenes as his successor. (*Strab. Paus.*)

PHILETAS, a grammarian and poet of Cos, in the reign of king Philip, and of his son Alexander the Great. He was made preceptor to Ptolemy Philadelphus. The elegies and epigrams which he wrote have been greatly commended by the ancients.

PHILIBEG, is a little plaid, called also kilt, and is a sort of short petticoat reaching nearly to the knees, worn by the Scotch Highlanders. It is a modern substitute for the lower part of the plaid, being found to be less cumbersome, especially in time of action, when the Highlanders used to tuck their breechdun into their girdle. Almost all of them have a great pouch of badger and other skins, with tassels dangling before, in which they keep their tobacco and money.

PHILIP the apostle was a native of Bethsaida in Galilee. Jesus Christ having seen him, said to him, "Follow me," John i. 43, 44, &c. Philip followed him; and soon after finding Nathanael, Philip said to him, "We have found the Messiah, of whom Moses and the prophets have spoken, Jesus of Nazareth, the son of Joseph." Nathanael asked him, "Can any thing good come out of Nazareth?" To which Philip replied, "Come and see." Then he brought Nathanael to Jesus, and they went with him to the marriage of Cana in Galilee. St. Philip was called at the very beginning of our Saviour's mission; and when Jesus Christ was about to feed the 5000 that followed him (Luke vi. 13. Mat. x. 2. John vi. 5-7.), he

asked St. Philip, only to prove him, whence bread might be bought for such a multitude of people? Philip answered, that 200 pennyworth of bread would not be sufficient for every one to taste a little. Some Gentiles having a curiosity to see Jesus Christ, a little before his passion, they addressed themselves to St. Philip (John xii. 21, 22.), who mentioned it to St. Andrew, and these two to Christ. At the last supper, Philip desired our Saviour, that he would be pleased to show them the Father, being all that they desired (John xiv. 8—10.) But Jesus told them, that seeing the Son they saw the Father also. 'This is all we find concerning Philip in the gospel.

PHILIP, the second of the seven deacons, was chosen by the apostles after our Saviour's resurrection. (Acts vi. 5.) This deacon, they say, was of Cæsarea in Palestine. It is certain that his daughters lived in this city. (Acts xxi. 8, 9.) After the death of St. Stephen, all the Christians, excepting the apostles, having left Jerusalem, and being dispersed in several places, St. Philip went to preach at Samaria (id. viii. 1, 2, &c.), where he performed several miracles, and converted many persons. He baptized them; but, being only a deacon, he could not confer on them the Holy Ghost. Wherefore, having made known to the apostles at Jerusalem, that Samaria had received the word of God, Peter and John came thither, and the Samaritans that were converted received the Holy Ghost. St. Philip was probably at Samaria when the angel of the Lord ordered him to go to the south part of the country, in the road that leads from Jerusalem to old Gaza. Philip obeyed, and there met with an Ethiopian eunuch belonging to queen Candace, who had the care of her revenues, and had been at Jerusalem to worship God there (id. viii. 26, 27, &c.) He was then returning into his own country, and was reading the prophet Isaiah as he went along in his chariot. Philip, hearing the eunuch reading the prophet Isaiah, said to him, Do you understand what you read? The eunuch replied, How should I understand, except somebody explain it to me? He desired Philip therefore to come and sit down by him in the chariot. The passage the eunuch was reading is this, "He was led as a sheep to the slaughter, and like a lamb dumb before his shearer, so he opened not his mouth." The eunuch then says to Philip, pray, whom does the prophet speak of in this place? Is it of himself, or of some other? Then Philip began to instruct him concerning Jesus Christ. And having gone on together, they came to a fountain; when the eunuch said to Philip, Here is water, what hinders me from being baptized? Philip told him that he might be so, if he believed with all his heart. He replied, I believe that Jesus Christ is the Son of God. He then ordered the chariot to stop, and they both alighted and went down into the water; where Philip baptized the eunuch. Being come out of the water, the Spirit of the Lord took away Philip, and the eunuch saw no more of him. But Philip was found again at Azotus, and he

preached the gospel in all the cities he passed through, till he arrived at Cæsarea in Palestine. After this, the scripture does not inform us of any particulars relating to Philip. The modern Greeks say that he went to Tralles in Asia, where he founded a church, of which he was the apostle and bishop; and where he rested in peace, after performing many miracles. The Latins, on the contrary, say that he died at Cæsarea, and that three of his daughters were there buried with him.

It is thought, that the eunuch converted by St. Philip was the first apostle of the Ethiopians; and that the Abyssines boast of having received the Christian faith from him.

PHILIP I. son of Argeus, succeeded his father on the throne of Macedonia, and reigned 38 years B. C. 40.

PHILIP II. was the fourth son of Amyntas, king of Macedonia. He was sent to Thebes as an hostage by his father, where he learnt the art of war under Epaminondas, and studied the manners of the Greeks. He was recalled to Macedonia, and at the death of his brother Perdiccas he ascended the throne as guardian of his nephew, but he soon made himself independent. The neighbouring nations ridiculing his youth appeared in arms. Unable to meet them as yet in the field, he suspended their fury by presents, and soon turned his arms against Amphipolis, tributary to the Athenians, which he conquered, and added to the kingdom of Macedonia. He next meditated the destruction of Athens. His designs, however, were as yet immature, and before he could attempt this, the Thracians and the Illyrians demanded his attention. He made himself master of a Thracian colony, from the gold mines of which he received the greatest advantages. He married Olympias the daughter of Neoptolemus, king of the Molossi, by whom he had Alexander the Great. Every thing seemed now to conspire to his aggrandizement, and Philip received in one day the intelligence of the birth of a son, an honourable crown at the Olympic games, and a victory over the barbarians of Illyricum. He next laid siege to Olynthus, to the assistance of which the Athenians, roused by the eloquence of Demosthenes, sent 17 vessels and 2,000 men. This increased rather than satiated his ambition: he declared his inimical sentiments against the power of Athens and the independence of all Greece, by laying this siege against a place, which, on account of its situation and consequence, would prove most injurious to the interests of the Athenians, and most advantageous to the intrigues and military operations of every Macedonian; but the money of Philip prevailed over all their efforts. The greatest part of the citizens suffered themselves to be bribed by Macedonian gold, and Olynthus having surrendered, was instantly reduced to ruins. His successes were as great in every part of Greece. In his attempts, however, to make himself master of Eubœa, Philip was unsuccessful, and Phocion, who despised his gold as well as his

meanness, obliged him to evacuate that island. From Eubœa he turned his arms against the Scythians, but the advantages he obtained over this indigent nation were inconsiderable, and he again made Greece an object of plunder. He advanced far in Boeotia, and a general engagement was fought at Chæronea. The fight was long and bloody, but Philip obtained the victory. At the battle of Chæronea the independence of Greece was extinguished, and Philip, unable to find new enemies in Europe, meditated new conquests. He was nominated general of the Greeks against the Persians, whose invasions of Greece under Darius and Xerxes he had resolved to avenge. But he was stopped in the midst of his warlike preparations; Pausanias, as he entered the theatre at the celebration of the nuptials of his daughter Cleopatra, stabbed him, it is supposed, at the instigation of his wife Olympias. The ridiculous honours which Olympias paid to her husband's murderer, however, strengthened the suspicion. The character of Philip is that of a sagacious, artful, prudent, and intriguing monarch. He possessed much perseverance, and in the execution of his plans he was always vigorous. The private character of Philip lies open to censure, and raises indignation. He was murdered in the 47th year of his age, and the 24th of his reign, about 336 years B. C. He is the first monarch whose life and actions are described with peculiar accuracy and historical faithfulness. Philip was the father of Alexander the Great, and of Cleopatra, by Olympias; he had also by Audaca, an Illyrian, Cyna, who married Amyntas the son of Perdiccas, Philip's elder brother; by Nicaspolis, a Thessalian, Nicæa, who married Cassander; by Philinna, a Larissæan dancer, Aridæus, who reigned some time after Alexander's death; by Cleopatra, the niece of Attalus, Caranus and Europa, who were both murdered by Olympias; and Ptolemy, the first king of Egypt, by Arsinoë.—The last king of Macedonia, of that name, was son of Demetrius. Not satisfied with the kingdom of Macedonia, Philip aspired to become the friend of Annibal, and wished to share with him the spoils of Rome. The Romans, however, discovered his intrigues, and though much weakened by the Carthaginians, yet they were soon enabled to meet him in the field of battle. The consul Lævinus entered without delay his territories of Macedonia, and after he had obtained a victory over him near Apollonia, and reduced his fleet to ashes, he compelled him to sue for peace. This peaceful disposition was not permanent, and he again assisted Annibal with men and money. The Romans then appointed T. Q. Flaminius to punish his perfidy, and the Roman consul with great expedition invaded Macedonia, and in a general engagement fought near Cynocephale, Philip being totally defeated, saved his life with difficulty by flying from the field of battle. Destitute of resources, he then was obliged to submit to the mercy of the conqueror, and to demand peace by his ambassadors, which was granted upon terms

disadvantageous and degrading to his dignity. In the midst of these public calamities, the peace of his family was disturbed by Perseus, the eldest of his sons, by a concubine, at whose instigation he put to death his son Demetrius. Having discovered the perfidy of Perseus, he attempted to make Antigonus, another son, his successor, but he was prevented from executing his purpose by death, in the 42d year of his reign, 179 years before the Christian era.

PHILIP, duke of Suabia, and son of Frederick Barbarossa, was elected emperor on the death of his brother Henry VI. in 1198. Another party of the electors, however, chose Otho, duke of Saxony, in opposition to him, which occasioned a civil war in Germany. In 1200 the pope declared himself in favour of Otho, and excommunicated Philip. In 1206 the pope absolved him, and endeavoured to bring about a reconciliation between the two rivals, but in vain, and Philip was assassinated at Bamberg in 1208, aged 34. (*Watkins*).

PHILIP I. king of France, succeeded his father in 1060, at the age of 8 years, under the regency of Baldwin V. count of Flanders, who acquitted himself in this important office with honour. Philip divorced his wife Bertha, and married Bertrade, the wife of the count of Anjou, for which he was excommunicated by the council of Poitiers, in 1100. He died at Milan in 1108.

PHILIP II. surnamed the August, born 1165, was crowned on the death of his father Lewis VII. in 1180. He went to the holy land with Richard I. king of England, and the two monarchs took Acre, a place of considerable consequence. A difference breaking out between the kings, Philip returned to his own country; and not long afterwards he turned his arms against the English, from whom he took some places in Normandy, although he had bound himself by oath not to do any thing against Richard in his absence. Philip married the princess of Denmark, whom he divorced, and espoused the daughter of a nobleman, for which the pope excommunicated him, but the sentence was afterwards taken off on his promise to take back his former wife. He maintained the cause of Arthur against his uncle John, king of England, and a long war ensued between the two countries. The pope took part with John, because he declared himself a vassal of the holy chair. Some of the English nobility, tired of his conduct, offered the crown to Philip, but he only sent them his son Lewis, who was crowned at London in 1216, and soon after excommunicated at Rome. On the death of John, the English acknowledged his son Henry III. and forced Lewis to quit the kingdom. Philip died in 1223.

PHILIP III. surnamed the Hardy, was proclaimed king of France, in Africa, on the death of St. Lewis his father, in 1270. He obtained a victory over the infidels, and having made peace with the king of Tunis, returned to France. He marched against Peter of Ar-

ragon, to punish that monarch for the inhuman massacre commonly called the Sicilian Vespers, and died of a malignant disorder in the expedition at Perpignan, in 1285, in the 40th year of his age. In his reign the first letters of nobility were given.

PHILIP IV. born in 1268, succeeded his father Philip III. in 1285. He entered into a war with Edward I. king of England, which was not of long duration. He had a long contest with pope Boniface VIII. respecting his right to present to benefices. The pope thundered his bulls of excommunication against him, in which he maintained that the temporal powers were subject to the spiritual, and that he had a right to depose sovereigns. Philip, however, resisted his pretensions, and the succeeding pontiffs annulled the proceedings of Boniface. This prince distinguished himself by persecuting the order of knight's templars, and died in 1314.

PHILIP V. surnamed the Long, succeeded Lewis Hutin, his brother, in 1316. He made war against the Flemings, renewed an alliance with the Scotch, drove the Jews from his kingdom, and died in 1322, aged 28. (*Watkins*).

PHILIP DE VALOIS, first king of France, of the branch of the Valois, ascended the throne on the death of Charles the Fair, 1328. His elevation was disputed by Edward III. of England, and a terrible war was kindled between the two nations. Edward invaded the country, and victory marked his steps. His fleet defeated the French ships in 1340, and in 1346 the battle of Cressy was fought, in which France lost nearly 30,000 men. The loss of Calais, and other important places, were the rewards of this signal victory. Philip died 1350, aged 57.

PHILIP I. son of the emperor Maximilian, obtained the Spanish crown. He was of moderate abilities, but regarded as the fairest man of his age. He died at Burgos 1506, aged 28.

PHILIP II. son of Charles V. was king of Naples and Sicily, in 1554, on his father's abdication, and king of England by marriage with queen Mary, and two years after he ascended the Spanish throne by the resignation of his father. He obtained the famous victory of St. Quintin in 1557, during which, it is said, he was so terrified, that he made two vows; the one never again to appear in a fight, and the next, to erect a monastery to St. Lawrence, to whose powerful influence he ascribed the success of his arms. This victory, which might have made him master of France, was followed by the capture of only a few little towns; so that Charles, on hearing of the battle, asked if his son were at Paris, and being answered in the negative, turned his back with contempt on the messenger. Sanguinary in his conduct, and violent in his measures, Philip alienated the affections of the Flemings, who, harassed by his oppressions, threw off the yoke. In vain Alva, by valour and severity, attempted to restore subordina-

tion; seven provinces were severed from the Spanish yoke, and under the name of United Provinces, established their independence. Philip subdued Portugal to his power, and formed plans for the subjection of England, which the death of Mary had placed under the administration of Elizabeth. In 1558 the invincible armada sailed from Lisbon, for the conquest of England; but the storms and the valour of the English were enemies which the ambitious monarch was not prepared to encounter. The fleet was dispersed and cut to pieces, and when Philip heard of the loss of his 100 ships, and of 20,000 of his men, he replied with great resignation, I had sent my fleet against the English, and not against the winds; the Lord's will be done. He died 1590, aged 72. Though represented by some, ferocious and unprincipled as Tiberius, and by others, wise and discreet as Solomon, Philip may be considered as a man of great abilities, too much, indeed, guided by superstition, and too strongly influenced by family pride, and the love of universal dominion, yet, endowed with sagacity, able and eager to distinguish merit, and during a long reign, if not the first man, yet the chief personage in Europe.

PHILIP III. son of Philip II. succeeded to the Spanish throne at the age of 20. He made himself master of Ostend by his general Spinola, after a siege of three years, and the loss of 80,000 men; but by making peace with his enemies, he established the house of Nassau in the possession of the rebellious provinces of Holland. Philip issued a decree for the banishment of his Moorish subjects in 30 days, and thus robbed his kingdom of the arts, the knowledge, and the laborious services of above a million of men. He died soon after, a victim to court etiquette. While in the council, he complained of the disagreeable smell of the brazier which warmed the room; but as the officer who took care of the fire was absent, no one ventured to remove the offensive utensil, and in consequence the king was taken ill and soon after died, 1621, aged 43.

PHILIP IV. son of Philip III. was king of Spain, 1621. The war with Holland was renewed, and in 1635 Philip increased the number of his enemies, by declaring against France; but though at first victorious, his troops were defeated. The Catalonians also rebelled under the patronage of France, and Portugal shook off the yoke, and re-established her monarch under the auspicious government of the house of Braganza, 1640. These losses, occasioned by the negligence of his minister Olivares, instead of rousing the nation, were received with indifference. Olivares was indeed disgraced; but the war was concluded by a dishonourable treaty, which separated Roussillon, Artois, and Alsace, from the Spanish crown, 1659, and soon after Philip acknowledged the independence of Portugal. He died 1665, aged 60.

PHILIP V. duke of Anjou, ascended the Spanish throne 1700, agreeable to the will of

the last monarch Charles II. Though well received at Madrid, his elevation was opposed by Charles of Austria, supported by the emperor, by England, Holland, Savoy, Prussia, and Portugal. The new king lost Arragon, Gibraltar, the Belears, Sardinia, and Naples, and quitted his capital: but while he thought of flying to America, he received assistance from France, under the duke of Vendome, and in the battle of Villa Viciosa, in 1710, he recovered his losses, and was firmly fixed on his throne by the treaty of Utrecht, in 1713. Under the administration of Alberoni, Philip by degrees made himself master of Majorca, Minorca, Sardinia, and Palermo, but in 1717 his fleet was defeated in the Mediterranean by Byng. Philip soon after became a prey to superstitious fears, and resigned his crown, in 1724, in favour of his son Louis, and retired to a monastery. The sudden death of the new monarch, a few months after, of the smallpox, left the kingdom without a master, and Philip again resumed the reins of government. In 1733 he joined France, against the emperor, and saw his son Don Carlos, with an army of 30,000 men, conquer Sicily and Naples, and establish himself on the throne. He died 1746, aged 63, after a reign of 45 years. (*Lempriere*).

PHILIP ISLANDS, two islands in the Pacific ocean, discovered by captain Hunter in 1791. They are five miles asunder, but almost joined by a sandy spit, which reaches, for about two thirds of the distance, from the easternmost island to the most westerly, which last is the smallest. They are covered with shrubs, have few tall trees on them, and the land is low. Lon. of the eastern island 140. 3 E. Lat. 8. 6 S.

PHILIPPOPOL, a city of European Turkey, in Romania, and an archbishop's see. It is of considerable size, but meanly built, and chiefly inhabited by Greeks. It stands on the Marissa, 50 miles N.W. of Adrianople. Lon. 24. 50 E. Lat. 42. 25 N.

PHILIPPEVILLE, a fortified town of France, in the department of Ardennes. It was anciently called Corbigny, and received its present name in honour of Philip II. of Spain. It is 16 miles N. of Rocroy.

PHILIPPEI or **PHILIPPI**, certain pieces of money coined in the reign of Philip of Macedonia, and with his image.

PHILIPPI, a town of Macedonia, anciently called Dato, situate at the E. of the river Strymon. It was called Philippi, after Philip, king of Macedonia, and became celebrated for two battles fought there in October, B. C. 42, at the interval of about 20 days, between Augustus and Antony, and the republican forces of Brutus and Cassius, in which the former obtained the victory.

The city of Philippi is likewise remarkable on account of an epistle written by St. Paul to the church in that place. It was a Roman colony. It is also remarkable for being the birth-place of Adrastus, the Peripatetic philosopher, and dis-

ciple of Aristotle. The town is still in being, and is an archbishop's see; but greatly decayed and badly peopled. However, there is an old amphitheatre, and several other monuments of its ancient grandeur. Lon. 44. 55 E. Lat. 41. 0 N.

PHILIPPIANS (Epistle of Paul to the), a canonical epistle of the New Testament, is generally agreed to have been written by St. Paul in the second year of his imprisonment at Rome, about A. D. 62.

The christian church was first planted at Philippi about the year of our Lord 51, by St. Paul; who, having made a progress through Galatia and Phrygia (Acts xvi.) and intending to pursue his tour through Bithynia, was admonished by the Spirit to go over to Macedonia. Being arrived at Philippi, he, with Timothy, Luke, and Silas, spent some days there in preaching the gospel. Though the apostle soon after left the city, Luke and Timothy continued there some time longer to carry on the work; and this was one reason why he fixed on the latter to visit the Philippians in his absence (Philip. ii. 19—22.) It appears from Acts xx. 6, that St. Paul made the Philippians a second visit.

This Epistle, which is quite of the practical kind, seems to be designed to comfort the Philippians, under the concern they had expressed at the news of his imprisonment; to check a party spirit, that appears to have broken out among them, and to promote on the contrary an entire union and harmony of affection; to guard them against being seduced from the purity of the christian faith by Judaizing teachers; to support them under the trials with which they struggled; and above all, to inspire them with a concern to adorn their profession by the most exalted attainments in the divine life.

PHILIPPICS. (*φιλιππικαι λογοι*.) In literature, is a name which is given to the orations of Demosthenes against Philip king of Macedon. The Philippics are reckoned the master-pieces of that great orator: Longinus quotes many instances of the sublime from them; and points out a thousand latent beauties. Indeed, that pathetic in which Demosthenes excelled, the frequent interrogations and apostrophes wherewith he attacked the indolence of the Athenians, where could they be better employed? Whatever delicacy there be in the oration against Leptines, the Philippics have the advantage over it, were it only on account of the subject, which gives Demosthenes so fair a field to display his chief talent, we mean, with Longinus, that of moving and astonishing.

PHILIPPIC is likewise applied to the fourteen orations of Cicero against Mark Antony. Cicero himself gave them this title in his epistles to Brutus; and posterity have found it so just, that it has been continued to our times. Juvenal, Sat. x. calls the second the divine Philippic, and witnesses it to be of great fame, *conspicua divina Philippica fama*.

That orator's entitling his last and most valued orations after the *Philippics* of Demosthenes shows the high opinion he had of them. Cicero's *Philippics* cost him his life; Mark Antony having been so irritated with them, that, when he arrived at the triumvirate, he procured Cicero's murder, cut off his head, and stuck it up in the very place whence the orator had delivered the *Philippics*.

PHILIPPINE, a strong town of the Netherlands, in Flanders. It was taken by the French in 1747, restored in 1748, and again taken in 1794. It is seated on an arm of the Scheldt, 15 miles N. by W. of Ghent.

PHILIPPINE ISLANDS, a large group of islands in the N. Pacific ocean, discovered by Magellan, in 1521, and afterward conquered by the Spaniards, in the reign of Philip II. They lie 400 miles S.E. of China, and are said to be 1100 in number, but some hundreds of them are very small. The principal are, Luconia, Mindanao, Paragoa, Samar, Masbate, Mindoro, Luban, Panay, Leyta, Bohol, Zebu, Negros, St. John, and Abyo. This extensive group presents many volcanic appearances, and is subject to violent earthquakes, thunder, and rains. The air is hot and moist; and the soil is fertile in rice, bread-fruit, and many other useful vegetables and fruits. The cotton is of peculiar beauty, and the sugarcane and cocoa-nut trees are objects of particular culture. The trees are always green, and there are ripe fruits all the year. There are a great many wild beasts and birds, quite unknown in Europe; also many noxious and venomous creatures, and even herbs and flowers, that are poisonous. Gold, copper, and iron are among the certain products. The natives are not all of one original; they are affable, hospitable, and honest, and cultivate the land with abundant skill. The principal tribe are called Tagals, and seem of Malay origin. They are tall and well made, of a tawny complexion, and wear only a kind of shirt and loose drawers; but the dress of the women is chiefly a large mantle, and their black and beautiful hair is of great length. The houses are of bamboo covered with palm leaves, raised on pillars to the height of nine feet. The chief food is rice, cocoa-nut, and salted fish. See **LUCONIA**.

PHILIPPINES, a religious society of young women at Rome, so called from their taking St. Philip de Neri for their protector. The society consists of 100 poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of some religious women, who teach them to read, write, and work, and instruct them in the duties of Christianity. They wear a white veil, and a black cross on their breast. See **MACEDONIA**.

PHILIPPISTS, a sect or party among the Lutherans; the followers of Philip Melancthon. He had strenuously opposed the Ubiquists, who arose in his time; and the dispute growing still hotter after his death, the univer-

sity of Wittemberg, who espoused Melancthon's opinion, were called by the Flacians, who attacked it, *Philippists*.

PHILIPPUS (M. Julius), a Roman emperor of an obscure family in Arabia, whence he was surnamed Arabian. From the lowest rank in the army, he gradually rose to the highest offices, and made general of the pretorian guards. He assassinated Gordian to make himself emperor. To establish himself with more certainty on the imperial throne, he left Mesopotamia a prey to the invasions of the Persians, and hurried to Rome, where his election was universally approved by the senate and the Roman people. Philip rendered his cause popular by his liberality and profusion. His usurpation, however, was short; Philip was defeated by Decius, who had proclaimed himself emperor in Pannonia, and he was assassinated by his own soldiers near Verona, in the 45th year of his age, and the 5th of his reign, A.D. 249. His son, who bore the same name, and who had shared with him the imperial dignity, was also massacred in the arms of his mother. Young Philip was then in the 12th year of his age.

PHILIPS (Thomas), of Ickford, Bucks, was educated at St. Omer's, among the jesuits, whose order he quitted. He was promoted to a prebend in Tongres cathedral, and died at Liege, 1774, aged 66. He published a letter to a student in divinity, 8vo. a performance of merit—the life of cardinal Pole, 2 vols. 4to. a work of celebrity.

PHILIPS (Fabian), a learned antiquary, born at Prestbury, Gloucestershire, 1601. He studied in the inns of court in London, and supported the king's prerogative, as filazer of the records of London, Middlesex, &c. He protested against the beheading of Charles I. and posted up his sentiments in the most public places of the city. He wrote various pamphlets, and died 1690.

PHILIPS (Catherine), daughter of Mr. Fowler, a London merchant, married, at the age of 16, James Philips of Cardigan, esq. and died of the small-pox 1664, aged 33. She translated Corneille's *Pompey*—and also the four first acts of his *Horace*, besides various poems under the name of Orinda. Her poetical talents were celebrated by the learned men of her age, by lords Orrery, Roscommon, and by Cowley and others.

PHILIPS (John), an English poet, born at Bampton, Oxfordshire. He was educated at Winchester school, and Christ church, Oxford. His first poem was the *Splendid Shilling*, an excellent composition, which describes the most trivial things in the lofty language of Milton. *Blenheim* was the next effusion of his muse, and the *Cyder*, a happy imitation of Virgil's *Georgics*, appeared 1705. He wrote besides a Latin ode to his patron St. John, and it has been remarked, that such was his addiction to tobacco, that he has introduced the praises of it in all his pieces except *Blenheim*. This excellent poet, whose character in pri-

vate life was amiable, died of a consumption and asthma at Hereford, 15th February 1708, aged 32.

PHILIPS (Ambrose), an English poet, educated at St. John's college, Cambridge. While at college he wrote his Pastorals, a species of poetry in which he is said to have excelled, though Pope ridiculed them, and to render his satire more poignant, introduced into the *Guardian* a paper which in a delicate strain of irony compared the pastorals of the two rivals, and gave in an affected manner the superiority to Philips. Philips resented the attack, and unable to revenge himself by his pen, he stuck up a rod at Button's coffee-house, and threatened to chastise his antagonist wherever he saw him. In his circumstances he was very independent, and as the friend of the Hanoverian succession he was made a justice of the peace, and in 1717 appointed one of the lottery commissioners. He was in 1734 registrar of Dublin prerogative court, and he sat in the parliament of Ireland for Armagh. He returned in 1748 to England to live on an annuity of 400*l.* but a stroke of the palsy carried him off, 18th June, 1749, aged 78. He wrote three dramatic pieces of some merit, the *Distressed Mother*—the *Briton*—and *Humphrey, duke of Gloucester*—beside his *Life of Archbishop Williams*, and a little poem called a *Winter Piece*, which Pope condescended to commend, though he ridiculed all his other works. Dr. Johnson says he was eminent for bravery, and in conversation solemn and pompous.

PHILIPS NORTON, a town of Somersetshire, with a market on Thursday, seven miles S. by E. of Bath, and 104 W. of London.

PHILIPSBURG, a town of New Jersey, in Sussex county, situate on the river Delaware, opposite Easton in Pennsylvania, 41 miles N.W. of Trenton.

PHILIPSBURG, a town of New York, in Dutchess county, near which is a mine that yields virgin silver. It stands on the E. side of Hudson river, 28 miles N. by E. of New York.

PHILISTÆ (anc. geog.), the country of the Philistines (Bible); which lay along the Mediterranean, from Joppa to the boundary of Egypt, and extending to inland places not far from the coast. *Palæstini*, the people; *Palæstina*, the country (Josephus): Afterwards applied to the whole of the Holy Land and its inhabitants. *Philistæi*, the people (Septuagint); *Philistini* (Vulgate); the *Caphtorim* and *Philistim*, originally from Egypt, and descendants of Cham (Moses). Expelled and destroyed the Hivites, the ancient inhabitants, and occupied their country; that is, the region which retained the name of *Philistim*, in which that of *Caphtorim* was swallowed up.

PHILISTINES, were the ancient inhabitants of Palestine, well known in sacred history. These people are sometimes called in Scripture *Cherethites* and *Caphtorims*. The earlier part of their history is, like that of

most other nations, very obscure and uncertain. The authors of the *Universal History* tell us, that they were descended from the *Casluhim* partly, and partly from the *Caphtorim*, both from the loins of *Mizraim* the son of Ham, the son of Noah. Moses tells us (*Deut. xi. 23.*), that they drove out the *Avim* or *Avites* even to *Azzah* or *Gazah*, where they settled; but when this happened cannot be determined. On the whole, however, our learned authors are clearly of opinion, that the *Casluhim* and *Caphtorim*, from whom the *Philistines* are descended, came originally from Egypt, and called the country which they had conquered by their own name. (See **PALESTINE**.) Many interpreters, however, think, that *Caphtor* was but another name for *Cappadocia*, which they imagine to have been the original country of the *Philistines*. But father Calmet, in a particular dissertation prefixed to the first book of *Samuel*, endeavours to show that they were originally of the isle of *Crete*.

PHILLO, in antiquity, an Arcadian maid, by whom *Hercules* had a son. The father exposed his daughter, but she was saved by means of her lover, who was directed to the place where she was doomed to perish, by the chirping of a magpie, which imitated the plaintive cries of a child.

PHILLYDRUM, in botany, a genus of the class *monandria*, order *monogynia*. *Spathes* one-flowered; calyxless; corol four-petalled, irregular; capsule three-celled, many-seeded. One species; an herbaceous plant of China and *Cochinchina*, with spongy, woolly stem, and golden, peduncled flowers, supported by short pointed, hairy spathes.

PHILLYREA. Mock-privet. In botany, a genus of the class *diandria*, order *monogynia*. Corol four-cleft; berry two-celled, one-seeded. Three species, as follow:

1. *P. media*. Lance-leaved *phillyrea*. An ever-green shrub, with opposite leaves; white, axillary flowers in bunches; varying in the shape of its leaves. South of Europe.

2. *P. angustifolia*. Narrow-leaved *phillyrea*. Linear, very entire leaves, opposite branches; white axillary clustered flowers; small berries. A native of Spain and Italy.

3. *P. latifolia*. Broad-leaved *phillyrea*. Leaves ovate heart-shaped; white axillary clustered flowers.

These shrubs are hardy enough to thrive in the open air of our own climate; and never lose their leaves but in very severe winters, being soon however renewed on the return of summer.

PHILO, an ancient Greek writer, was of a noble family among the Jews, and flourished at Alexandria during the reign of *Caligula*. He was the chief of an embassy sent to Rome about the year 42, to plead the cause of the Jews against *Apion*, who was sent by the Alexandrians to charge them with neglecting the honours due to *Cæsar*. *Caligula*, however, would not allow him to speak, and behaved to him in such a manner that *Philo* was

in considerable danger of losing his life. Others again tell us that he was heard; but that his demands were refused. He afterwards went to Rome in the reign of Claudius; and then, Eusebius and Jerome inform us, he became acquainted with St. Peter, with whom he was on terms of friendship. Photius adds, that he became a Christian, and afterwards, from some motive of resentment, renounced it. Great part of this, however, is uncertain; for few believe that St. Peter was at Rome so early as the reign of Claudius, if he ever was there at all.

Philo was educated at Alexandria, and made very great progress in eloquence and philosophy. After the fashion of the time, he cultivated, like many of his nation and faith, the philosophy of Plato, whose principles he so thoroughly imbibed, and whose manner he so well imitated, that it became a common saying, *Aut Plato philonizat, aut Philo platonizat*. Josephus says, he was a man "eminent on all accounts;" and Eusebius describes him, "copious in speech, rich in sentiments, and sublime in the knowledge of holy writ." He was, however, so much immersed in philosophy, particularly the Platonic, that he neglected the Hebrew language, and the rites and customs of his own people. Scaliger says, that Philo "knew no more of Hebrew and Syriac than a Gaul or a Scythian." Grotius is of opinion, that "he is not fully to be depended on, in what relates to the manners of the Hebrews;" and Cudworth goes further; for, "though a Jew by nation (says he), he was yet very ignorant of Jewish customs." Fabricius thinks differently; for, though he allows some inadvertencies and errors of Philo with regard to these matters, yet he does not see a sufficient foundation on which to charge so illustrious a doctor of the law with ignorance. He allows, however, that Philo's passion for philosophy had made him more than half a Pagan; for it led him to interpret the whole law and the prophets upon Platonic ideas; and to admit nothing as truly interpreted which was not agreeable to the principles of the academy. Besides, this led him farther; he turned every thing into allegory, and deduced the darkest meanings from the plainest words. Philo's writings abound with high and mystical, new and subtle, far-fetched and abstracted notions; and indeed the doctrines of Plato and Moses are so promiscuously blended, that it is not an easy matter to assign to each his principles. There are certainly, however, in his works many excellent things. Though he is continually platonising and allegorising the Scriptures, he abounds with fine sentiments and lessons of morality, and his morals are rather the morals of a Christian than of a Jew. History, together with his own writings, give us every reason to believe that he was a man of great prudence, constancy, and virtue.

His works were first published in Greek by Turnebus, at Paris, 1552. A Latin translation made by Gelenius was afterwards added, and printed several times with it. The Paris edi-

tion of 1640, in folio, was the best for a whole century; which made Cotelierius say, that "Philo was an author that deserved to have a better text and a better version." In 1742, a handsome edition of his work was published at London by Dr. Mangey, in two volumes, folio; there is also an edition in 5 vols. 8vo. published A.D. 1785—1792.

PHILO of Byblos, a grammarian of the first century, who acquired celebrity by his works, the chief of which is the Phœnician history of Sanconiathon, translated into Greek, some fragments of which remain.

PHILO of Byzantium, an architect, who flourished 300 B. C. He wrote a treatise of machines used in war, which is extant in the *Mathematici veteres*, 1693, folio. There is also attributed to him another piece, entitled, *De septem Orbis Spectaculis*, Rome, 1640, but on no just grounds.

PHILOCTES, one of the admirals of the Athenian fleet, during the Peloponnesian war. He recommended to cut off the right hand of such of the enemies as were taken. His plan was adopted by all the ten admirals except one, but instead of being conquerors, they were totally defeated at Ægospotamus by Lysander, and Philoctes was put to death with the rest of his colleagues.

PHILOCTETES, in fabulous history, son of Pœan and Demonassa, was one of the Argonauts according to Hyginus, and the arm-bearer and particular friend of Hercules. He erected the pile on which the hero was consumed, and received from him his arrows, dipped in the gall of the hydra. He had no sooner paid the last offices to Hercules, than he returned to Melibœa, where his father reigned. He then visited Sparta, where he became one of the suitors of Helen, and soon after accompanied the Greeks to the Trojan war, with seven ships. He was prevented from joining his countrymen at Aulis, on account of the offensive smell which arose from a wound in his foot, and at the instigation of Ulysses, he was carried to the island of Lemnos. In this retreat he remained for some time, till the Greeks, on the tenth year of the Trojan war, were informed by the oracle, that Troy could not be taken without the arrows of Hercules, then in the possession of Philoctetes. Upon this, Ulysses, accompanied by Diomedes, went to Lemnos, to prevail upon Philoctetes to come and finish the siege. Philoctetes refused to go to Troy, and was about to return to Melibœa, when the manes of Hercules immediately ordered him to repair to the Grecian camp, where he should be cured of his wounds, and put an end to the war. Philoctetes obeyed, and being restored to health by Æsculapius, he destroyed an immense number of the Trojans, among whom was Paris. When Troy had been ruined, he set sail from Asia, but as he was unwilling to visit his native country, he came to Italy, where he built a town in Calabria, which he called Petilia. The sufferings and adventures of Philoctetes are

the subject of one of the best tragedies of Sophocles.

PHILODEMUS, a poet in the age of Cicero, who rendered himself known by his lascivious and indelicate verses.

PHILOLAUS, of Crotona, was a celebrated philosopher of antiquity, of the school of Pythagoras, to whom that philosopher's Golden Verses have been ascribed. He made the heavens his principal object of contemplation; and has been idly supposed to have been the author of that true system of the world which Copernicus afterwards revived. This made Bullialdus place the name of Philolaus at the head of two works written to illustrate and confirm that system.

"He was," says Dr. Enfield, "a disciple of Archytas, and flourished in the time of Plato. It was from him that Plato purchased the written records of the Pythagorean system, contrary to an express oath taken by the society of Pythagoreans, pledging themselves to keep secret the mysteries of their sect. It is probable, that among these books were the writings of Timæus, upon which Plato formed the dialogue which bore his name. Plutarch relates, that Philolaus was one of the persons who escaped from the house that was burned by Cylon during the life of Pythagoras; but this account cannot be correct. Philolaus was contemporary with Plato, and therefore certainly not with Pythagoras. Interfering in affairs of state, he fell a sacrifice to political jealousy."

PHILOLOGER. *s.* (φιλόλογος.) One whose chief study is language; a grammarian; a critic (*Sprab*).

PHILOLOGICAL. *a.* (from *philology*.) Critical; grammatical (*Watts*).

PHILOLOGIST. *s.* (See **PHILOLOGER**.) A critic; a grammarian.

PHILOLOGY, a term under which some comprehend universal literature, so that each one may there include whatever he thinks proper; as grammar, rhetoric, poetry, antiquities, history, criticism, the interpretation of authors, &c. This seems to be not only making an abuse of words, but creating confusion in those matters where too much regularity and precision cannot be observed. The term philology is composed of the Greek words *φιλος* and *λογος*, which imply a love or study of languages. It appears, therefore, that philology is nothing more than a general knowledge of languages, of the natural and figurative signification of their words and phrases, and, in short, of all that relates to expression in the different dialects of nations, as well ancient as modern.

Languages, in general, may be divided into,

1. Ancient languages; which are those that have become extinct with the people who spoke them, or have been so altered and disfigured, that they no longer resemble the languages which were spoken by those people.

2. Oriental languages; the study of which is necessary in order to the understanding of the text of the holy scriptures, especially the Old Testament.

3. Learned languages; which are those that are indispensably necessary in the study of erudition, and particularly literature; which, while there were people in the world who made them their common language, were called living; but as no nation now makes use of them, they are called dead languages, and are therefore to be learned from books or in schools.

4. Modern languages; in which are distinguished, first, the common languages of the European nations; and secondly, the languages of the people who inhabit the three other parts of the world. See **LANGUAGE**.

PHILOMATHES, a lover of learning or science.

PHILOMELA, in fabulous history, a daughter of Pandion, king of Athens, and sister to Procne, who had married Tereus, king of Thrace. Procne being separated from Philomela, became quite melancholy, till she prevailed upon her husband to bring her sister to Thrace. Tereus obeyed, but he had no sooner obtained Pandion's permission to conduct Philomela to Thrace, than he became enamoured of her, and resolved to gratify his passion. He offered violence to Philomela, and afterwards cut off her tongue, that she might not be able to discover his barbarity. He next confined her in a lonely castle, and returned to Thrace, where he told Procne that Philomela had died by the way. Procne put on mourning for the loss of Philomela; but a year had scarcely elapsed before she was informed that her sister was not dead. Philomela, during her captivity, described on a piece of tapestry the brutality of Tereus, and privately conveyed it to Procne, who, under the pretence of celebrating the orgies of Bacchus, hastened to deliver her sister, and concerted the plan of punishing the cruelty of Tereus. She murdered her son Itylus, in the sixth year of his age, and served him up as food before her husband. Tereus, in the midst of his repast, called for Itylus, but Procne informed him he was then feasting on his flesh, and, at that instant, Philomela, by presenting the head of Itylus, convinced the monarch of the cruelty of the scene. He attempted to stab Procne and Philomela, but was instantly changed into a hoopoe, Philomela into a nightingale, Procne into a swallow, and Itylus into a pheasant. This tragical scene happened at Daulis, in Phocis.

PHILOMOT. *a.* (corrupted from *feuille morte*, a dead leaf.) Coloured like a dead leaf.

PHILONIDES, a courier of Alexander, who ran from Sicyon to Elis, 160 miles, in nine hours, and returned the same journey in fifteen hours.

PHILONOME, the second wife of Cynus, the son of Neptune. She became enamoured of Tennes, her husband's son by his first wife Proclea, the daughter of Clytius, and when he refused to gratify her passion, she accused him of attempts upon her virtue. Cynus believed the accusation, and ordered Tennes to be thrown into the sea.

PHILOSOPHEME. *s.* (φιλοσοφημα.) Principle of reasoning; theorem (*Watts*).

PHILOSOPHER. *s.* (*philosophus*, Latin; *philosophe*, French.) A man deep in knowledge, either moral or natural (*Hooker*).

PHILOSOPHER'S STONE. This, which was at first denominated *chrysopæa* (χρυσωπεια) or the golden art, or fabrication of gold, by a transmutation of the base and imperfect metals into this metal of the noblest kind, is a study which has been pursued almost immemorially by persons possessing very indistinct views of chemistry, and especially by that class of chemists who were formerly denominated alchemists.

The principle on which the last proceeded was the following. They conceived that all metals were formed of a peculiar earth, which they called mercurial, which was more or less mature in its different compounds, and more or less intermixed with sulphur or other foreign matters. In consequence of which they conceived, secondly, that in order to transmute the imperfect into perfect metals, nothing more is necessary than to free them from such foreign materials, and to mature them by sublimation.

There were other alchemists who conceived that mercury or quicksilver contains in itself the principles of all the other metals; judging chiefly from its great splendour, its great weight, and its great activity and volatility: and hence numberless experiments were attempted upon this metal, which was tortured by every possible contrivance to obtain from it that which never was in it, nor ever can be in it. In the absurdly mysterious language in which the alchemists indulged, and which was designed to lock up their art and experiments altogether from the eye of the public, we find *Aristeus*, who was a celebrated adept, thus prescribing one of the processes for subliming quicksilver with some particular alloy, in order to produce gold. "Take," says he, "king *Gabertin* and the princess *Beya* his sister, a young lady, beautiful, fair, and exceedingly delicate; marry them together, and *Gabertin* will die almost immediately. But be not alarmed: for after eighty days *Gabertin* will revive from his ashes, and become more beautiful and perfect than he was before his death; will beget with *Beya* a red child, more beautiful and perfect than themselves."

Many of these adepts were well skilled in sleight of hand, and hence often performed tricks which could not fail to impose upon the great body of those who were witnesses of them. It is related that *Helvetius*, a celebrated and truly learned Dutch physician, having one day declaimed with great violence in one of his lectures, against the vanity and absurdity of attempting to make gold, was visited by an alchemical adept, who gave him a small sample of powder, which thrown into a crucible filled with melted lead would transform the lead into gold; and that this learned physician did so, and obtained a certain quantity of that metal. *Helvetius* then hastened to the

adept for farther information upon so important a subject; but the latter had given him a false address, and was not to be found. A similar trick is said to have been played upon the emperor *Ferdinand*. An adept came to him, and offered to transform mercury into gold in his presence. Mercury was in consequence immediately put into a crucible in the witnessing of the prince, and the adept having performed certain operations, a button of gold was found at the bottom of the vessel: but while those who were present were employed in examining and assaying the gold, the adept suddenly disappeared, to the great regret of the emperor, who already beheld in idea the immense treasures which he hoped to obtain by an acquisition of this great secret.

Many similar attempts have been made at different periods in our own country, in consequence of which *Henry VI.* who appears to have been imposed upon in some such manner as the emperor *Ferdinand*, granted letters patent to certain persons who undertook to find out the philosopher's stone, and to change other metals into gold, &c. to be free from the penalty of the stat. 5 *Henry IV.* made against the attempts of deceptive alchemists. Stat. 34 *Henry VI.* 3 last. 74.

In the present day it would be a waste of time to enter into any minute detection of such impositions or absurd pretensions. We now know with tolerable decisiveness that every distinct metal is a simple substance as distinct from every other metal as fire is from frost; and that a crystal may as soon be converted into a seed as lead into mercury, or mercury into gold.

PHILOSOPHIC. PHILOSOPHICAL. *a.* (*philosophique*, Fr. from *philosophy*.) 1. Belonging to philosophy; suitable to a philosopher; formed by philosophy (*Milton*). 2. Skilled in philosophy (*Shakspeare*). 3. Frugal; abstemious (*Dryden*).

PHILOSOPHICALLY. *ad.* In a philosophical manner; rationally; wisely (*Bentley*).

To PHILOSOPHIZE. *v. a.* (from *philosophy*.) To play the philosopher; to reason like a philosopher; to moralize; to search into nature; to inquire into the causes of effects (*L'Estrange*).

PHILOSOPHY, is a word derived from the Greek, which literally signifies the love of wisdom. In its usual acceptation, however, it denotes a science or collection of sciences, of which the universe is the object; and of the term thus employed many definitions have been given, differing from one another according to the different views of their several authors. By *Pythagoras*, philosophy is defined *επιστημη των ολων*, "the knowledge of things existing;" by *Cicero*, after *Plato*, *scientia rerum divinarum et humanarum cum causis*; and by the illustrious *Bacon*, *interpretatio nature*. Whether any of these definitions be sufficiently precise, and at the same time sufficiently comprehensive, may be questioned; but if philosophy in its utmost extent be capable of being adequately defined, it is not here that the definition should be given. "Explanation," says an acute writer, (*Tatham*) is the first office of a teacher; definition, if it be

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good, is the last of the inquirer after truth ; but explanation is one thing, and definition quite another." It may be proper, however, to observe, that the definition given by Cicero is better than that of Pythagoras, because the chief object of the philosopher is to ascertain the causes of things ; and in this consists the difference between his studies and the natural historian, who merely enumerates phenomena, and arranges them into separate classes.

The principal objects of philosophy are, God, nature, and man. That part of it which treats of God is called theology ; that which treats of nature, physics, and metaphysics ; and that which treats of man, logic and ethics. These are not separate and independent sciences, but, as Bacon expresses it, branches from the same trunk.

The universe, that unbounded object of the contemplation, the curiosity and the researches of man, may be considered in two different points of view.

In the first place, it may be considered merely as a collection of existences, related to each other by means of resemblances and distinction, situation, succession, and derivation, as making parts of a whole. In this view it is the subject of pure description.

To acquire an acquaintance with, or a knowledge of, the universe in this point of view, we must enumerate all the beings in it, mention all their sensible qualities, and mark all these relations for each. But this would be labour immense ; and, when done, an undistinguishable chaos. A book containing every word of a language would only give us the materials, so to speak, of this language. To make it comprehensible, it must be put into some form, which will comprehend the whole in a small compass, and enable the mind to pass easily from one word to another related to it. Of all relations among words, the most obvious are those of resemblance and derivation. An etymological dictionary, therefore, in which words are classed in consequence of their resemblances, and arranged by means of their derivative distinctions, will greatly facilitate the acquisition of the language.

Just so in nature : the objects around us may be grouped by means of their resemblance, and then arranged in those groups by means of their distinctions and other relations. In this classification we are enabled to proceed by means of our faculty of abstracting our attention from the circumstances in which things differ, and turning it to those only in which they agree. By the judicious employment of this faculty, we are able not only to distribute the individuals into classes, but also to distribute those classes into others still more comprehensive, by discovering circumstances of resemblance among them : for, the fewer the circumstances are which concur to form that resemblance which has engaged our attention, the greater is the number of dissimilar circumstances which are neglected ; and the more extensive will be the class of individuals in which the resemblance is observed. Thus, a number of individuals resembling each other in the single circumstance of life, composes the most extensive kingdom of animals. If it be required that they shall further resemble in the circumstance of having feathers, a prodigious number of animals are excluded, and we form the inferior class of birds. We exclude a great number of birds, by requiring a further similarity of web feet, and have the order of anseres. If we add *lingua citiata*, we confine the

attention to the genus of anates. In this manner may the whole objects of the universe be grouped, and arranged into kingdoms, classes, orders, genera, and species.

Such a classification and arrangement is called natural history ; and must be considered as the only foundation of any extensive knowledge of nature. To the natural historian, therefore, the world is a collection of existences, the subject of descriptive arrangement. His aim is threefold.

1. To observe with care, and describe with accuracy, the various objects of the universe.

2. To determine and enumerate all the great classes of objects ; to distribute and arrange them into all their subordinate classes, through all degrees of subordination, till he arrive at what are only accidental varieties, which are susceptible of no farther distribution ; and to mark with precision the principles of this distribution and arrangement, and the characteristics of the various assemblages.

3. To determine with certainty the particular group to which any proposed individual belongs.

Description therefore, arrangement, and reference, constitute the whole of his employment ; and in this consists all his science.

Did the universe continue unchanged, this would constitute the whole of our knowledge of nature : but we are witnesses of an uninterrupted succession of changes, and our attention is continually called to the events which are incessantly happening around us. These form a set of objects vastly more interesting to us than the former ; being the sources of almost all the pleasures or pains we receive from external objects.

We are therefore much interested in the study of the events which happen around us, and strongly incited to prosecute it : but they are so numerous and so multifarious, that the study would be immense, without some contrivance for abbreviating and facilitating the task. The same help offers itself here as in the study of what may be called quiescent nature. Events, like existences, are susceptible of classification, in consequence of resemblances and distinction ; and by attention to these, we can acquire a very extensive acquaintance with active nature. Our attention must be chiefly directed to those circumstances in which many events resemble each other, while they differ perhaps in a thousand others. Then we must attend to their most general distinctions ; then to distinctions of smaller extent, and so on.

It is in this way accordingly that we have advanced in our knowledge of active nature, and are gradually, and by no means slowly, forming assemblages of events more and more extensive, and distributing these with greater and greater precision into their different classes.

In the zealous and attentive prosecution of this task, a very remarkable and interesting observation occurs. In describing those circumstances of similarity among events, and particularly in distributing them according to those similarities, it is impossible for us to overlook that constancy which is observed in the changes of nature in the events which are the objects of our contemplation. Events which have once been observed to accompany each other are observed always to do so. The rising of the sun is always accompanied by the light of day, and his setting by the darkness of night. Sound argument is accompanied by conviction, impulse by motion, kindness by a feeling of gratitude, and the perception of good by desire. The unex-

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cepted experience of mankind informs us, that the events of nature go on in certain regular trains; and if sometimes exceptions seem to contradict this general affirmation, more attentive observation never fails to remove the exception. Most of the spontaneous events of nature are very complicated; and it frequently requires great attention and penetration to discover the simple event amidst a crowd of unessential circumstances which are at once exhibited to our view. But when we succeed in this discovery, we never fail to acknowledge the perfect uniformity of the event to what has been formerly observed.

But this is not all: we firmly believe that this uniformity will still continue; that fire will melt wax, will burn paper, will harden clay, as we have formerly observed it to do: and whenever we have undoubted proofs that the circumstances of situation are precisely the same as in some former case, though but once observed, we expect with irresistible and unshaken confidence that the event will also be the same.

It is not surely necessary to adduce many proofs of the universality of this law of human thought. The whole language and actions of men are instances of the fact. In all languages there is a mode of construction which is used to express this relation as distinct from all others, and the conversation of the most illiterate never confounds them, except when the conceptions themselves are confounded. The general employment of the active and passive verb is regulated by it. *Turris eversa est a militibus; turris eversa est terre motu*, express two relations, and no schoolboy will confound them. The distinction therefore is perceived or felt by all who can speak grammatically. Nor is any language without general terms to express this relation, cause—effect—to occasion. Nay, it is a fact in the mind of brutes, who hourly show that they expect the same uses of every subject which they formerly made of it; and without this, animals would be incapable of subsistence, and man incapable of all improvement. From this alone memory derives all its value; and even the constancy of natural operation would be useless, if not matched or adapted to our purposes by this expectation of and confidence in that constancy.

After all the labours of ingenious men to discover the foundation of this irresistible expectation, we must be contented with saying that such is the constitution of the human mind. It is an universal fact in human thought; and for any thing that has been yet discovered, it is an ultimate fact, not included in any other still more general. We shall soon see that this is sufficient for making it the foundation of true human knowledge; all of which must in like manner be reduced to ultimate facts in human thought.

We must consider this undoubted feeling, this persuasion of the constancy of nature, as an instinctive anticipation of events similar to those which we have already experienced. The general analogy of nature should have disposed philosophers to acquiesce in this, however unwelcome to their vanity. In no instance of essential consequence to our safety or well-being are we left to the guidance of our boasted reason: God has given us the surer conduct of natural instincts. No case is so important as this: in none do we so much stand in need of a guide which shall be powerful, infallible, and rapid in its decisions. Without it we must remain incapable of all instruction from experience, and therefore of all improvement.

Our sensations are undoubtedly feelings of our mind. But all those feelings are accompanied by an instinctive reference of them to something distinct from the feelings themselves. Hence arises our perception of external objects, and our very notions of this externity (pardon the term). In like manner, this anticipation of events, this irresistible connection of the idea of fire with the idea of burning, is also a feeling of the mind: and this feeling is by a law of human nature referred, without reasoning, to something external as its cause; and, like our sensation, it is considered as a sign of that external something. It is like the conviction of the truth of a mathematical proposition. This is referred by us to something existing in nature, to a necessary and eternal relation subsisting between the ideas which are the subjects of the proposition. The conviction is the sign or indication of this relation by which it is brought to our view. In precisely the same manner, the irresistible connection of ideas is interpreted as the sensation or sign of a necessary connection of external things or events. These are supposed to include something in their nature which renders them inseparable companions. To this bond of connection between external things we give the name of causation. All our knowledge of this relation of cause and effect, is the knowledge or consciousness of what passes in our own minds during the contemplation of the phenomena of nature. If we adhere to this view of it, and put this branch of knowledge on the same footing with those called the abstract sciences, considering only the relations of ideas, we shall require demonstrative science. If we take any other view of the matter, we shall be led into inextricable mazes of uncertainty and error.

We see then, that the natural procedure of our faculty of abstraction and arrangement, in order to acquire a more speedy and comprehensive knowledge of natural events, presents them to our view in another form. We not only see them as similar events, but as events naturally and necessarily conjoined. And the expression of resemblance among events is also an expression of concomitancy; and this arrangement of events in consequence of their resemblance is in fact the discovery of those accompaniments. The trains of natural appearance being considered as the appointments of the Author of Nature, has occasioned them to be considered also as consequences of laws imposed on his works by their great author, and every thing is said to be regulated by fixed laws. But this is the language of analogy. When a sovereign determines on certain trains of conduct for his subjects, he issues his orders. These orders are laws. He enforces the observance of them by his authority; and thus a certain regularity and constancy of conduct is produced. But should a stranger, ignorant of the promulgation of these laws, and of the exerted authority of the magistrate, observe this uniformity of conduct, he would ascribe it to the genius and disposition of the people; and his observation would be as useful to him for directing the tenor of his own conduct, as the knowledge of the subject-himself of the real source of this constancy is for directing his.

Just so in nature, while the theologian pretends, from his discoveries concerning the existence and superintendence of God, to know that the constant accompaniment of events is the consequence of laws which the Great Author and Governor of the universe has imposed on his works, the ordinary philosopher, a stranger to this scene, and to the

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unsearchable operations of the SUPREME MIND, must ascribe this constancy to the nature of the things. There is a great resemblance between the expression *natural law* and *grammatical rule*. Rule in strict language implies command; but in grammar it expresses merely a generality of fact, whether of flexion or construction. In like manner, a law of nature is to the philosopher nothing but the expression of a generality of fact. A natural or physical law is a generally observed fact; and whenever we treat any subject as a generally observed fact, we treat it physically. It is a physical law of the understanding that argument is accompanied by conviction; it is a physical law of the affection that distress is accompanied by pity; it is a physical law of the material world that impulse is accompanied by motion.

And thus we see that the arrangement of events, or the discovery of those general points of resemblance, is in fact the discovery of the laws of nature; and one of the greatest and most important is, that the laws of nature are constant.

There is no question that this view of the universe is incomparably more interesting and important than that which is taken by the natural historian; contemplating every thing that is of value to us, and, in short, the whole life and movement of the universe. This study, therefore, has been dignified with the name of philosophy and of science; and natural history has been considered as of importance only in so far as it was conducive to the successful prosecution of philosophy.

But the philosopher claims a superiority on another account; he considers himself as employed in the discovery of causes, saying that philosophy is the study of the objects of the universe as related by causation, and that it is by the discovery of these relations that he communicates to the world such important knowledge. Philosophy, he says, is the science of causes. The vulgar are contented to consider the prior of two inseparably conjoined events as the cause of the other; the stroke on a bell, for instance, as the cause of sound. But it has been clearly shown by the philosopher, that between the blow on the bell and the sensation of sound there are interposed a long train of events. The blow sets the bell [a trembling; this agitates the air in contact with the bell; this agitates the air immediately beyond it; and thus between the bell and the ear may be interposed a numberless series of events, and as many more between the first impression on the ear and that last impression on the nerve by which the mind is affected. He can no longer therefore follow the nomenclature of the vulgar. Which of the events of this train therefore is the cause of this sensation? none of them: it is that something which inseparably connects any two of them, and constitutes their bond of union. These bonds of union or causes he considers as residing in one or both of the connected objects: diversities in this respect must therefore constitute the most important distinctions between them. They are therefore with great propriety called the qualities, the properties, of these respective subjects.

As the events from which we infer the existence of these qualities of things resemble in many respects such events as are the consequences of the exertion of our own powers, these qualities are frequently denominated powers, forces, energies. Thus, in the instance just now given of the sound of a bell, we infer the powers of impulse,

elasticity, nervous irritability, and animal sensibility.

In consequence of this inference of a necessary connection between the objects around us, we not only infer the posterior event from the prior, or, in common language, the effect from the cause, but we also infer the prior from the posterior, the cause from the effect. We not only expect that the presence of a magnet will be followed by certain motions in iron-filings, but, when we observe such motions, we infer the presence and agency of a magnet. Joy is inferred from merriment, poison from death, fire from smoke, and impulse from motion. And thus the appearances of the universe are the indications of the powers of the objects in it. Appearances are the language of nature, informing us of their causes. And as all our knowledge of the sentiments of others is derived from our confidence in their veracity; so all our knowledge of nature is derived from our confidence in the constancy of natural operations. A veracity and credulity necessarily resulting from that law of our mental constitution by which we are capable of speech, conduct us in the one case; and the constancy of nature, and the principle of induction, by which we infer general laws from particular facts, conduct us in the other. As human sentiment is inferred from language, and the existence of external things from sensation; so are the laws of nature, and the powers of natural objects, inferred from the phenomena. It is by the successful study of this language of nature that we derive useful knowledge. The knowledge of the influence of motives on the mind of man enables the statesman to govern kingdoms, and the knowledge of the powers of magnetism enables the mariner to pilot a ship through the pathless ocean.

Such are the lofty pretensions of philosophy. It is to be wished that they be well founded; for we may be persuaded that a mistake in this particular will be fatal to the advancement of knowledge. An author of great reputation gives us an opportunity of deciding this question in the way of experiment. He says that the ancients were philosophers, employed in the discovery of causes, and that the moderns are only natural historians, contenting themselves with observing the laws of nature, but paying no attention to the causes of things. If he speaks of their professed aim, we apprehend that the assertion is pretty just in general. With very few exceptions, indeed, it may be affirmed of his favourite Aristotle, the philosopher *κατ' ἐξοχὴν*, and of sir Isaac Newton. We select these two instances, both because they are set in continual opposition by this author, and because it will be allowed that they were the most eminent students of nature (for we must not yet call them philosophers) in ancient and modern times. Aristotle's professed aim, in his most celebrated writings, is the investigation of causes; and in the opinion of this author, he has been so successful that he has hardly left any employment for his successors beside that of commenting upon his works. We must on the other hand acknowledge that Newton makes no such pretensions, at least in that work which has immortalised his name, and that his professed aim is merely to investigate the general laws of the planetary-motions, and to apply these to the explanation of particular phenomena. Nor will we say that he has left no employment for succeeding enquirers; but, on the contrary, confess that he has only begun the study, has discovered but one law, and has enabled us to explain only the phenomena comprehended in it

alone. But he has not been unsuccessful; his investigation has been complete; and he has discovered beyond all possibility of contradiction a fact which is observed through the whole extent of the solar system; namely, that every body, nay that every particle in it, is continually deflected toward every other body; and that this deflection is, in every instance, proportional to the quantity of matter in that body toward which the deflection is directed, and to the reciprocal of the square of the distance from it. He has therefore discovered a physical law of immense extent. Nor has he been less successful in the explanation of particular phenomena. Of this there cannot be given a better instance than the explanation of the lunar motions from the theory of gravity begun by Newton "*Mathesi sua facem preferente;*" and now brought to such a degree of perfection, that if the moon's place be computed from it for any moment within the period of two thousand years back, it will not be found to differ from the place on which she was actually observed by one hundredth part of her own breadth.

"Discimus hinc tandem qua causa argentea
Phœbe

Passibus haud æquis graditur; cur, subdita nulli
Hactenus astronomo, numerorum frena recuset.
Quæ toties animos veterum torsere sophorum,
Quæque scholas frustra rauco certamine vexant,
Obvia conspicimus, nubem pellente mathesi;
Qua superos penetrare domos, et ardua cœli
Newtoni auspiciis jam dat contingere templa."

We may now desire the champions of the science of causes to name any one cause which has really been discovered by their great master, whether in the operations of mind or of body. But they must not on this occasion adduce the investigation of any natural law in which he has sometimes succeeded. With still greater confidence may we challenge them to produce any remarkable instance of the explanation of natural phenomena either of mind or body. By explanation, we mean an account of the production, and an appreciation of all the circumstances, susceptible of a scrupulous comparison with fact, and perfectly consistent with it. It is here that the weakness of this philosopher's pretensions is most conspicuous; and his followers candidly acknowledge, that in the enquiries which proceed by experiment, we have not derived great assistance from Aristotle's philosophy. But this, say they, does not derogate from the pre-eminence of his philosophy, because he has shown that the particular fields of observation are to be cultivated only by means of experiment. But surely every field of observation is particular. There is no abstract object of philosophical research, the study of which shall terminate in the philosophy of universals. In every kind of enquiry, that cause alone must be supposed to act which we understand so far as to be able to appreciate its effects in particular circumstances, and compare them with fact, and see their perfect coincidence. If we have discovered causes, they are known as far as they are discovered.

Their genuine effects are known, and therefore the phenomena which result from their agency are understood. When therefore it is acknowledged, as it must be acknowledged, that mankind have made but little advances in the knowledge of nature, notwithstanding the pretended discovery of causes by Aristotle, and the conducting clue of his philosophy, till of late years; and when it is also

allowed that now, while we are every day making great additions to this subordinate knowledge, the causes which Aristotle has discovered are forgotten, and his philosophy is neglected; there is great room for suspecting (to say the least), that either the causes which philosophy pretends to have discovered are not real, or that Aristotle and his followers have not aimed at the discovery of causes, but only at the discovery of natural laws, and have failed in the attempt.

There seems here to be a previous question: Is it possible to discover a philosophical cause, that something which is neither the prior nor the posterior of the two immediately adjoining events, but their bond of union, and is distinct from the union itself? It is evident that this is an enquiry purely experimental. It is of human knowledge we speak. This must depend on the nature of the human mind. This is a matter of contingency, known to us only by experiment and observation. By observing all the feelings and operations of the mind, and classing and arranging them like any other object of science, we discover the general laws of human thought and human reasoning; and this is all the knowledge we can ever acquire of it, or of any thing else.

Much has been written on this subject. The most acute observation and sound judgment have been employed in the study: and we may venture to say, that considerable progress has been made in pneumatology. Many laws of human thought have been observed, and very distinctly marked; and philosophers are busily employed, some of them with considerable success, in the distribution of them into subordinate classes, so as to know their comparative extent, and to mark their distinguishing characters with a precision similar to what has been attained in botany and other parts of natural history; so that we may hope that this study will advance like others. But in all these researches, no phenomena have occurred which look like the perception or contemplation of these separate objects of thought, these philosophical causes, this power in abstracto. No philosopher has ever pretended to state such an object of the mind's observation, or attempted to group them into classes.

We may say at once, without entering into any detail, that those causes, those bonds of necessary union between the naturally conjoined events or objects, are not only perceived by means of the events alone, but are perceived solely in the events, and cannot be distinguished from the conjunctions themselves. They are neither the objects of separate observation, nor the productions of memory, nor inferences drawn from reflection on the laws by which the operations of our minds are regulated; nor can they be derived from other perceptions in the way of argumentative inference. We cannot infer the paroxysm of terror from the appearance of impending destruction, nor the fall of a stone when not supported, as we infer the incommensurability of the diagonal and side of a square. This last is implied in the very conception or notion of a square; not as a consequence of its other properties, but as one of its essential attributes; and the contrary proposition is not only false, but incapable of being distinctly conceived. This is not the case with the other phenomenon, or any matter of fact. The proofs which are brought of a mathematical proposition, are not the reason of its being true, but the steps by which this truth is brought into our view; and frequently, as in the instance now given, this truth is

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perceived, not directly, but consequentially, by the inconceivableness of the contrary proposition.

Mr. Hume derives this irresistible expectation of events from the known effect of custom, the association of ideas. The related event is brought into the mind by this well-known power of custom, with that vivacity of conception which constitutes belief or expectation. But without insisting on the futility of his theory of belief, it is sufficient to observe, that this explanation begs the very thing to be proved, when it ascribes to custom a power of any kind. It is the origin of this very power which is the subject in dispute. Besides, on the genuine principles of scepticism, this custom involves an acknowledgment of past events, of a something different from present impressions, which, in this doctrine (if doctrine it can be called), are the only certain existences in nature: and, lastly, it is known that one clear experience is a sufficient foundation for this unshaken confidence and anticipation. General custom can never, on Mr. Hume's principles, give superior vivacity to any particular idea.

This certain necessity of it as a separate object of observation, and this impossibility to derive this notion of necessary and causal connection between the events of the universe from any source, have induced two of the most acute philosophers of Europe, Mr. Leibnitz and Father Malebranche, to deny that there is any such connection, and to assert that the events of the universe go on in corresponding trains, but without any causal connection, just as a well-regulated clock will keep time with the motions of the heavens without any kind of dependence on them. This harmony of events was pre-established by the Author of the universe, in suberviency to the purposes he had in view in its formation.

All those purposes which are cognisable by us, may certainly be accomplished by this perfect adjustment. But without insisting on the fantastic wildness of this ingenious whim, it is quite enough to observe, that it also is a begging of the question, because it supposes causation when it ascribes all to the agency of the Deity.

Thus have we searched every quarter, without being able to find a source from which to derive this perception of a necessary connection among the events of the universe, or of this confident expectation of the continuance of physical laws; and yet we are certain of the feeling, and of the persuasion, be its origin what it may: for we speak intelligibly on this subject; we speak familiarly of cause, effect, power, energy, necessary connection, motives and their influence, argument and conviction, reasons and persuasion, allurements and emotions, of gravity, magnetism, irritability, &c.; and we carry on conversations on these subjects with much entertainment and seeming instruction. Language is the expression of thought, and every word expresses some notion or conception of the mind; therefore it must be allowed that we have such notions as are expressed by cause, power, energy. But it is here, as in many cases, we perceive a distinction without being able to express it by a definition; and that we do perceive the relation of causation as distinct from all others, and in particular as distinct from the relation of contiguity in time and place; or the relation of agent, action, and patient, must be concluded from the uniformity of language, which never confounds them except on purpose, and when it is perceived. But even here we shall find, that none of the terms

used for expressing those powers of substance which are conceived as the causes of their characteristic phenomena really express any thing different from the phenomena themselves. Let any person try to define the terms gravity, elasticity, sensibility, and the like, and he will find that the definition is nothing but a description of the phenomenon itself. The words are all derivatives, most of them verbal derivatives, implying action, gravitation, &c. As the general resemblances in shape, colour, &c. are expressed by the natural historian by generic terms, so the general resemblances in event are expressed by the philosopher in generic propositions, which, in the progress of cultivation, are also abbreviated into generic terms.

This abundantly explains the consistency of our language on this subject, both with itself and with the operations of nature, without however affording any argument for the truth of the assumption, that causes are the object of philosophic research as separate existences; or that this supposed necessary connection is a necessary truth, whether supreme or subordinate. But since the perception of it has its foundation in the constitution of the human mind, it seems entitled to the name of a first principle. We are hardly allowed to doubt of this, when we consider the importance of it, and the care of nature to secure us in all things essential to our safety and well-being, from all danger, from inattention, ignorance, or indolence, by an instinct infallible in its information, and instantaneous in its decisions. "It would not be like her usual care (says Hume), if this operation of the mind, by which we infer like effects from like causes, and *vice versa*, were entrusted to the fallacious deduction of our reason, which is slow in its operations, appears not in any degree during the first years of infancy, and in every age and period of human life is extremely liable to error. It is more conformable to her ordinary caution (mark the acknowledgment) to secure so necessary an act of the mind by some instinct, or blind tendency, which may be infallible and rapid in all its operations, may discover itself at the first appearance of life, and may be independent of all the laboured deductions of reason. As she has taught us the use of our limbs, without giving us any knowledge of the nerves and muscles by which they are actuated; so she has implanted in us an instinct, which carries forward the thought in a course conformable to that established among external objects, though we be ignorant of the powers and forces on which this regularity depends."

Such a knowledge is quite unnecessary, and therefore causes are no more cognoscible by our intellectual powers than colours by a man born blind; nay, whoever will be at the pains to consider this matter agreeably to the received rules and maxims of logic, will find that necessary connection, or the bond of causation, can no more be the subject of philosophical discussion by man, than the ultimate nature of truth. It is precisely the same absurdity or incongruity, as to propose to examine light with a microscope. Other rational creatures may perceive them as easily as we hear sounds. All that we can say is, that their existence is probable, but by no means certain. Nay, it may be (and we never know it) that we are not the efficient causes of our own actions, which may be effected by the Deity or by ministering spirits; and this may even be true in the material world. But all this is indifferent to the real occupation of the philosopher, and does not

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affect either the certainty, the extent, or the utility of the knowledge which he may acquire.

We are now able to appreciate the high pretensions of the philosopher, and his claim to scientific superiority. We now see that this can neither be founded on any scientific superiority of his object, nor of his employment. His object is not causes; and his discoveries are nothing but the discovery of general facts, the discovery of physical laws; and his employment is the same with that of the descriptive historian. He observes and describes with care and accuracy the events of nature; and then he groups them into classes, in consequence of resembling circumstances, detected in the midst of many others which are dissimilar and occasional. By gradually throwing out more circumstances of resemblance, he renders his classes more extensive; and, by carefully marking those circumstances in which the resemblance is observed, he characterises all the different classes: and, by a comparison of these with each other, in respect to the number of resembling circumstances, he distributes his classes according to their generality and subordination; thus exhausting the whole assemblage, and leaving nothing unarranged but accidental varieties. In this procedure it is to be remarked, that every grouping of similar events is, *ipso facto*, discovering a general fact, a physical law; and the expression of this assemblage is the expression of the physical law. And as every observation of this constancy of fact affords an opportunity for exerting the instinctive inference of natural connection between the related subjects, every such observation is the discovery of a power, property, or quality, of natural substance. And from what has been said, this observation of event is all we know of the connection, all we know of the natural power. And when the philosopher proceeds further to the arrangement of events, according to their various degrees of complication, he is, *ipso facto*, making an arrangement of all natural powers according to their various degrees of subordinate influence. And thus his occupation is perfectly similar to that of the descriptive historian, classification and arrangement; and this constitutes all the science attainable by both.

Philosophy may therefore be defined the study of the phenomena of the universe, with a view to discover the general laws which indicate the powers of natural substances, to explain subordinate phenomena, and to improve art: or, in compliance with that natural instinct so much spoken of; philosophy is the study of the phenomena of the universe, with a view to discover their causes, to explain subordinate phenomena, and to improve art.

The task is, undoubtedly difficult, and will exercise our noblest powers. The employment is mainly in itself, and the result of it important. It therefore justly merits the appellation of philosophy, although its objects are nowise different from what occupy the attention of other men.

It is in experimental philosophy alone that hypotheses can have any just claim to admission; and here they are not admitted as explanations, but as conjectures serving to direct our line of experiments.

Effects only appear; and by their appearance, and the previous information of experience, causes are immediately ascertained by the perfect similarity of the whole train of events to other trains formerly observed: or they are suggested by more imperfect resemblances of the phenomena; and these suggestions are made with stronger or fainter

evidence, according as the resemblance is more or less perfect. These suggestions do not amount to a confidential inference, and only raise a conjecture. Wishing to verify or overturn this conjecture, we have recourse to experiment; and we put the subject under consideration in such a situation, that we can say what will be the effect of the conjectural cause if real. If this tallies with the appearance, our conjecture has more probability of truth, and we vary the situation, which will produce a new set of effects of the conjectured cause, and so on. It is evident that the probability of our conjecture will increase with the increase of the conformity of the legitimate effects of the supposed cause with the phenomena, and that it will be entirely destroyed by one disagreement.

The sphere of our intuitive knowledge is very limited; and we must be indebted for the greatest part of our intellectual attainments to our rational powers, and it must be deductive. In the spontaneous phenomena of nature, whether of mind or body, it seldom happens that the energy of that natural power which is the principle of explanation is so immediately connected with the phenomena that we see the connection at once. Its exertions are frequently concealed, and in all cases modified, by the joint exertions of other natural powers: the particular exertion of each must be considered apart, and their connection traced out. It is only in this way that we can discover the perhaps long train of intermediate operations, and also see in what manner and degree the real principle of explanation concurs in the ostensible process of nature.

In all such cases it is evident that our investigation (and investigation it most strictly is) must proceed by steps, conducted by the sure hand of logical method. As an instance selected from the material world, we may state Galileo's explanation of the cause of the rise of water in a pump. He says it is owing to the pressure of the air: that is his principle, and he announces it in all its extent. All matter, says he, is heavy, and in particular air is heavy. He then points out the connection of this general principle with the phenomenon. The rise of the water in the pump is shown to be a particular case of the general fact in hydrostatics that fluids in communicating vessels will stand at heights which are inversely as their densities, or that columns of equal weights are in equilibrium.

This way of proceeding is called arguing *a priori*, the synthetic method. It is founded on just principles; and the great progress which we have made in the mathematical sciences by this mode of reasoning shows to what length it may be carried with irresistible evidence. It has long been considered as the only inlet to true knowledge; and nothing was allowed to be known with certainty which could not be demonstrated in this way to be true. Accordingly logic, or the art of reasoning, which was also called the art of discovering truth, was nothing but a set of rules for successfully conducting this mode of argument.

Under the direction of this infallible guide, it is not surely unreasonable to expect that philosophy has made sure progress towards perfection: and as we know that the brightest geniuses of Athens and of Rome were for ages solely occupied in philosophical researches in every path of human knowledge, it is equally reasonable to suppose that the progress has not only been sure but great. We have seen that the explanation of an appearance in nature is nothing but the arrangement of it into that general class in which it was comprehended.

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The class has its distinguished mark, which, when it is found in the phenomenon under consideration, fixes it in its class, there to remain for ever an addition to our stock of knowledge.

The Aristotelian logic, the syllogistic art, that art so much boasted of as the only inlet to true knowledge, the only means of discovery, is in direct opposition to the ordinary procedure of nature, by which we every day, and in every action of our lives, acquire knowledge and discover truth. It is not the art of discovering truth, it is the art of communicating knowledge, and of detecting error: it is nothing more than the application of this maxim, "Whatever is true of a whole class of objects, is true of each individual of that class." This is not a just account of the art of discovering truth, nor is it a complete account of the art of reasoning. Reasoning is the producing belief; and whatever mode of argumentation invariably and irresistibly produces belief, is reasoning. The ancient logic supposes that all the first principles are already known, and that nothing is wanted but the application of them to particular facts. But were this true, the application of them, as we have already observed, can hardly be called a discovery; but it is not true; and the fact is, that the first principles are generally the chief objects of our research, and that they have come into view only now and then as it were by accident, and never by the labour of the logician. He indeed can tell us whether we have been mistaken; for, if our general principle be true, it must influence every particular case. If, therefore, it be false in any one of these, it is not a true principle. And it is here that we discover the source of that fluctuation which is so much complained of in philosophy. The authors of systems give a set of consecutive propositions logically deduced from a first principle, which has been hastily adopted, and has no foundation in nature. This does not hinder the amusement of framing a system from it, nor this system from pleasing by its symmetry; and it takes a run: but when some officious follower thinks of making some use of it, which requires the comparison with experience and observation, they are found totally unlike, and the whole fabric must be abandoned as unsound: and thus the successive systems were continually pushing out their predecessors, and presently met with the same treatment.

How was this to be remedied? The ratiocination was seldom egregiously wrong; the syllogistic art had ere now attained a degree of perfection which left little room for improvement, and was so familiarly understood by the philosophical practitioners, that they seldom committed any great blunders. Must we examine the first principles? This was a task quite new in science; and there were hardly any rules in the received systems of logic to direct us to the successful performance of it. Aristotle, the sagacious inventor of those rules, had not totally omitted it; but in the fervour of philosophic speculation he had made little use of them. His fertile genius never was at a loss for first principles, which answered the purpose of verbal disquisition without much risk of being belied on account of its dissimilitude to nature; for there was frequently no prototype with which his systematic doctrine could be compared. His enthusiastic followers found abundant amusement in following his example; and philosophy, no longer in the hands of men acquainted with the world, conversant in the great book of nature, was now confined almost entirely to recluse monks, equally ignorant of men and of things. But curiosity was awakened, and

the men of genius were fretted as well as disgusted with the disquisitions of the schools, which one moment raised expectations by the symmetry of composition, and the next moment blasted them by their inconsistency with experience.

They saw that the best way was to begin *de novo*, to throw away the first principles altogether, without exception or examination, and endeavour to find out new ones, which would stand the test of logic; that is, should in every case be agreeable to fact.

Philosophers began to reflect, that under the unnoticed tuition of kind nature we have acquired much useful knowledge. It is therefore highly probable, that her method is the most proper for acquiring knowledge, and that by imitating her manner we shall have the like success. We are too apt to slight the occupations of children, whom we may observe continually busy, turning every thing over and over, putting them into every situation, and at every distance. We excuse it, saying that it is an innocent amusement; but we should say, with an ingenious philosopher (Dr. Reid), that they are most seriously and rationally employed: they are acquiring the habits of observation; and by merely indulging an undetermined curiosity, they are making themselves acquainted with surrounding objects; they are struck by similitudes, and amused with mere classification. If some new effect occurs from any of their little plays, they are eager to repeat it. When a child has for the first time tumbled a spoon from the table, and is pleased with its jingling noise on the floor, if another lies within its reach, it is sure to share the same fate. If the child is indulged in this diversion, it will repeat it with a greediness that deserves our attention. The very first eager repetition shows a confidence in the constancy of natural operations, which we can hardly ascribe wholly to experience; and its keenness to repeat the experiment shows the interest which it takes in the exercise of this most useful propensity. It is beginning the study of nature; and its occupation is the same with that of a Newton comparing the motions of the moon by his sublime theory, and comparing his calculus with observation. The child and the philosopher are equally employed in the contemplation of a similarity of event, and are anxious that this similarity shall return. The child, it is true, thinks not of this abstract object of contemplation, but throws down the spoon again to have the pleasure of hearing it jingle. The philosopher suspects that the conjunction of events is the consequence of a general law of nature, and tries an experiment where this conjunction recurs. The child is happy and eager to enjoy a pleasure which to us appears highly frivolous; but it has the same foundation with the pleasure of the philosopher, who rejoices in the success of his experiment; and the fact, formerly a trifle to both, now acquires importance. Both go on repeating the experiment till the fact ceases to be a novelty to either: the child is satisfied, and the philosopher has now established a new law of nature.

Such (says this amiable philosopher) is the education of kind nature, who from the beginning to the end of our lives makes the play of her scholars their most instructive lessons, and has implanted in our mind the curiosity and the inductive propensity by which we are enabled and disposed to learn them. The exercise of this inductive principle, by which nature prompts us to infer general laws from the observation of particular facts, gives

us a species of logic new in the schools, but old as human nature. It is certainly a method of discovery; for by these means general principles, formerly unknown, have come into view.

It is a just and rational logic, for it is founded on, and indeed is only the habitual application of, this maxim, "That whatever is true with respect to every individual of a class of events, is true of the whole class." This is just the inverse of the maxim on which the Aristotelian logic wholly proceeds, and is of equal authority in the court of reason. Indeed the expression of the general law is only the abbreviated expression of every particular instance. See **INDUCTION**.

Philosophy has been divided into two branches, or considered under two circumstances, theoretical and practical.

Theoretical or speculative philosophy is employed in mere contemplation. Such is physics, which is a bare contemplation of nature, and natural things.

Theoretical philosophy again is usually subdivided into three kinds, viz. pneumatics, physics, or somatics, and metaphysics or ontology.

The first considers being, abstractedly from all matter: its objects are spirits, their natures, properties, and effects. The second considers matter, and material things: its objects are bodies, their properties, laws, &c.

The third extends to each indifferently: its objects are body or spirit.

In the order of our discovery, or arrival at the knowledge of them, physics is first, then metaphysics; the last arises from the two first considered together.

But in teaching, or laying down these several branches to others, we observe a contrary order; beginning with the most universal, and descending to the more particular. And hence we see why the Peripatetics call metaphysics, and the Cartesians pneumatics, the *prima philosophia*.

Others prefer the distribution of philosophy into four parts, viz. 1. Pneumatics, which considers and treats of spirits. 2. Somatics, of bodies. 3. The third compounded of both, anthropology, which considers man, in whom both body and spirit are found. 4. Ontosophy, which treats of what is common to all the other three.

Again, philosophy may be divided into three parts; intellectual, moral and physical: the intellectual part comprises logic and metaphysics; the moral part contains the laws of nature and nations, ethics and politics; and lastly the physical part comprehends the doctrine of bodies, animate or inanimate: these, with their various subdivisions, will comprize the whole of philosophy.

Practical philosophy is that which lays down the rules of a virtuous and happy life, and excites us to the practice of them. Most authors divide it into two kinds, answerable to the two sorts of human actions to be directed by it; viz. logic, which governs the operations of the understanding; and ethics, properly so called, which direct those of the will.

For the several particular sorts of philosophy, see the articles Arabian, Aristotelian, Atomical, Cartesian, Corpuscular, Epicurean, Experimental, Hermetical, Leibnitzian, Mechanical, Moral, Natural, Newtonian, Oriental, Platonic, Scholastic, Socratic, &c.

PHILOSTORGIUS, an ecclesiastical historian of Cappadocia, born about 388. He

was an Arian, and his history in 12 books begins with the controversy between Arius and Athanasius in 320, and ends about 425.

PHILOSTRATUS (Flavius), a Greek author, who wrote the life of Apollonius Tyaneus, and some other works still extant. He lived in the reign of the emperor Severus. Eusebius calls him an Athenian; Suidas a Lemnian. His style is sophisticated and affected, and the sources from whence he draws his materials are considered as not very good.

PHILOTAS, a son of Parmenio, distinguished in the battles of Alexander, and at last accused of conspiring against his life. He was tortured, and stoned to death, or according to some, stuck through with darts by the soldiers, B. C. 330. (*Curt.*).—There were others of this name, but of less note.

PHILOTIS, a servant maid at Rome, who saved her countrymen from destruction. After the siege of Rome by the Gauls, the Fidenates marched against the capital, demanding all the wives and daughters in the city, as the conditions of peace. The senators refused to comply, when Philotis advised them to send their female slaves, disguised in matron's clothes, and she offered to march herself at the head. Her advice was followed, and when the Fidenates had feasted late in the evening, and fallen asleep, Philotis lighted a torch as a signal for her countrymen to attack the enemy. The whole was successful, the Fidenates were conquered, and the senate, to reward the fidelity of the female slaves, permitted them to appear in the dress of the Roman matrons. (*Plut.* &c.)

PHILOXENUS, an officer of Alexander, who received Cilicia at the general division of the provinces. 2.—A dithyrambic poet of Cythera, who enjoyed the favour of Dionysius, tyrant of Sicily, for some time, till he offended him by seducing one of his female singers, for which he imprisoned him, and sent him to the quarries. Dionysius, at length, pleased with his pleasantry and his firmness, immediately forgave him. Philoxenus died at Ephesus, about 380 years before Christ. (*Plut.*).—There were others of inferior note of this name.

PHILTER, or **PHILTRE** (*philtrum*), in pharmacy, &c. a strainer.

PHILTER, is also used for a drug or preparation, which it is pretended will excite love.—The word is formed from the Greek *φιλος*, I love, or *φίλος*, lover. Philters are distinguished into true and spurious, and were given by the Greeks and Romans to excite love. The spurious are spells or charms, supposed to have an effect beyond the ordinary laws of nature by some magic virtue; such are those said to be given by old women, witches, &c.—The true philters are those supposed to work their effect by some natural and magnetical power. There are many grave authors who believe the reality of these philters, and allege matter of fact in confirmation of their sentiments.

To **PHILTER**. *v. a.* (from the noun.) To charm to love (*Gov. of the Tongue*).

PHILYCA, in botany. See **PHYLICA**.

PHILURA, one of the Oceanides. Saturn,

to escape from the vigilance of Rhea, changed himself into a horse, to enjoy the company of Philyra, by whom he had a son, half a man and half a horse, called Chiron. Philyra, ashamed of giving birth to such a monster, entreated the gods to change her nature. She was metamorphosed into a tree, called by her name among the Greeks.

PHIMOSIS. (*φίμωσις*, from *φίμω*, to bind up). The prepuce is formed by a continuation of the skin of the penis, which serves to cover the glans when the penis is not erected, and to allow for the time extension of the penis when erected; at which time, this portion of the skin that formed the prepuce does not cover the glans, but falls back upon the penis, and serves to cover part of that. The phimosis is a constriction or straitness of the extremity of the prepuce, which, preventing the glans from being uncovered, is often the occasion of many troublesome complaints. It may arise from different causes, both in children and grown persons. Children have naturally the prepuce very long; and as it exceeds the extremity of the glans, and is not liable to be distended, it is apt to contract its orifice, to produce a lodgement of a small quantity of urine about the glans, which if it remain so as to grow corrosive, will irritate the parts and produce inflammation, and perhaps excoriation, with an increased thickening and contraction of the prepuce so as scarcely to allow a probe to pass. The only mode of cure is by an operation. A phimosis may affect grown persons who cannot denude their glans, or at least not without pain, from the very same or some similar cause; we notwithstanding find them sometimes troubled with a phimosis, which might be suspected to arise from a venereal taint, but has, in reality, a much more innocent cause. There are, we know, sebaceous glands situated in the prepuce, round the corona, which secrete an unctuous humour, which sometimes becomes acrimonious, irritates the skin that covers the glans, and the irritation extending to the internal membrane of the prepuce, they both become inflamed, and yield a purulent serum, which cannot be discharged, because the glans is swelled, and the orifice of the prepuce contracted. We find also some grown up persons, who, though they never uncovered the glans, have been subject to phimosis from a venereal cause. In some, it is owing to gonorrhœa, where the matter lodged between the prepuce and the glans occasioned the same excoriation as the discharge before mentioned from the sebaceous glands. In others, it proceeds from venereal chancres on the prepuce, the glans, or the frænum; which producing an inflammation either on the prepuce or glans, or both, the extremity of the foreskin contracts, and prevents the discharge of the matter. The parts in a very little time are greatly tumified, and sometimes a gangrene comes on in less than two days.

PHINEUS, in fabulous history, a son of Agenor, king of Phenicia, or according to some, of Bithynia. He married Cleopatra, the

daughter of Boreas, by whom he had Plexippus and Pandion. After her death, he married Idæa, the daughter of Dardanus. Idæa, jealous of Cleopatra's children, accused them of attempts upon her virtue, and they were immediately condemned by Phineus to be deprived of their eyes. This cruelty was soon after punished by the gods. Phineus suddenly became blind, and the harpies were sent by Jupiter, to spoil the meats which were placed on his table. He was however delivered from these dangerous monsters by Zetes and Calais, who pursued them as far as the Strophades. He also recovered his sight by means of the Argonauts, whom he had received with great hospitality, and instructed in the easiest and speediest way by which they could arrive in Colchis. The causes of the blindness of Phineus are a matter of dispute among the ancients. Phineus was killed by Hercules.

PHIZ. *s.* (a ridiculous contraction from *physiognomy*.) The face (*Stepney*).

PHLEBOTOMIST. *s.* (from *φλεβ*, and *τεμνω*.) One that opens a vein; a blood-letter.

To PHLEBOTOMIZE. *v. a.* (*phlebotomiser*, Fr.) To let blood (*Howel*).

PHLEBOTOMY. (*phlebotomia*, *φλεβοτομία*, from *φλεβ*, a vein, and *τεμνω*, to cut.) The opening of a vein.

PHLEGETHON, a river of hell, whose waters were burning, as the word *φλεγω*, from which the name is derived, seems to indicate.

PHLEGM. (*phlegma*, *φlegma*, from *φλεγω*, to burn or to excite.) In chemistry it means water, but, in the common acceptation of the word, it is a thick and tenacious mucus secreted in the lungs.

PHLEGMAGOGUES. (from *φlegma*, phlegm, and *αγω*, to drive.) Medicines which promote a discharge of phlegm.

PHLEGMASIA (*phlegmasia*, *φlegμασία*, from *φλεγω*, to burn.) An inflammation.

PHLEGMASIA DOLENS. This disease principally affects women in the puerperal state; in a few instances it has been observed to attack pregnant women; and, in one or two cases, nurses on losing their children have been affected by it. Women of all descriptions are liable to be attacked by it during and soon after childbirth: but those whose limbs have been pained or anasarcous during pregnancy, and who do not suckle their offspring, are more especially subject to it. It has rarely occurred oftener than once to the same female. It supervenes to easy and natural, as well as to difficult and preternatural births. It sometimes makes its appearance in 24 or 48 hours after delivery, and at other times not till a month or six weeks after; but, in general, the attack takes place from the 10th to the 16th day of the lying in. It has, in many instances, attacked women who were recovering from puerperal fever; and in some cases has supervened, or succeeded, to thoracic inflammation. It not uncommonly begins with coldness and rigors; these are succeeded by heat, thirst, and other symptoms of pyrexia; and then pain, stiffness, and other symptoms of topical inflam-

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inflammation supervene. Sometimes the local affection is from the first accompanied with, but is not preceded by, febrile symptoms. Upon other occasions, the topical affection is neither preceded by puerperal fever, nor rigors, &c. but soon after it has taken place the pulse becomes more frequent, the heat of the body is increased, and the patient is affected with thirst, headach, &c. The pyrexia is very various in degree in different patients, and sometimes assumes an irregular remittent, or intermittent type. The complaint generally takes place on one side only at first, and the part where it commences is various; but it most commonly begins in the lumbar, hypogastric, or inguinal region, on one side, or in the hip, or top of the thigh; and corresponding labium pudendi. In this case the patient first perceives a sense of pain, weight and stiffness in some of the above-mentioned parts, which are increased by every attempt to move the pelvis or lower limb. If the part be carefully examined, it generally is found rather fuller or hotter than natural, and tender to the touch, but not discoloured. The pain increases, always becomes very severe, and in some cases is of the most excruciating kind. It extends along the thigh, and when it has subsisted for some time longer or shorter in different patients, the top of the thigh and the labium pudendi become greatly swelled, and the pain is then sometimes alleviated, but accompanied with a greater sense of distention. The pain next extends down to the knee, and is generally the most severe on the inside and back of the thigh, in the direction of the internal cutaneous and the crural nerves; when it has continued for some time, the whole of the thigh becomes swelled, and the pain is somewhat relieved. The pain then extends down the leg to the foot, and is commonly the most severe in the direction of the posterior tibial nerve; after some time the parts last attacked begin to swell, and the pain abates in violence, but is still very considerable, especially on any attempt to move the limb. The extremity being now swelled throughout its whole extent, appears perfectly, or nearly uniform, and it is not perceptibly lessened by an horizontal position, like an oedematose limb. It is of the natural colour, or even whiter; is hotter than natural; excessively tense, and exquisitely tender when touched. When pressed by the finger in different parts it is found to be elastic, little, if any, impression remaining, and that only for a very short time. If a puncture or incision be made into the limb, in some instances no fluid is discharged; in others a small quantity only issues out, which coagulates soon after; and in others a larger quantity of fluid escapes, which does not coagulate; but the whole of the effused matter cannot be drawn off in this way. The swelling of the limb varies both in degree, and in the space of time requisite for its full formation. In most instances it arrives at double the natural size, and in some cases at a much greater. In lax habits, and in patients whose legs have been very much affected with anasarca during pregnancy, the swelling takes place

more rapidly than in those who are differently circumstanced; it sometimes arrives, in the former class of patients, at its greatest extent in 24 hours, or less, from the first attack.

Instead of beginning invariably at the upper part of the limb, and descending to the lower, this complaint has been known to begin in the foot, the middle of the leg, the ham, and the knee. In whichever of these parts it happens to begin, it is generally soon diffused over the whole of the limb, and when this has taken place, the limb presents the same phenomena, exactly, that have been stated above, as observable when the inguen, &c. are first affected.

After some days, generally from two to eight, the febrile symptoms diminish, and the swelling, heat, tension, weight, and tenderness of the lower extremity begin to abate, first about the upper part of the thigh, or about the knee, and afterwards in the leg and foot. Some inequalities are found in the limb, which at first feel like indurated glands, but upon being more nicely examined, their edges are not so well defined as those of conglobate glands; and they appear to be occasioned by the effused matter being of different degrees of consistence in different points. The conglobate glands of the thigh and leg are sometimes felt distinctly, and are tender to the touch, but are seldom materially enlarged; and as the swelling subsides, it has happened, that an enlargement of the lymphatic vessels in some part of the limb has been felt, or been supposed to be felt.

The febrile symptoms having gradually disappeared, the pain and tenderness of the limb being much relieved, and the swelling and tension being considerably diminished, the patient is debilitated and much reduced, and the limb feels stiff, heavy, benumbed, and weak. When the finger is pressed strongly against it for some time in different points, it is found to be less elastic than at first, in some places retaining the impression of the finger for a longer, in other places for a shorter time, or scarcely at all. And, if the limb be suffered to hang down, or if the patient walk much, it is found to be more swelled in the evening, and assumes more of an oedematose appearance. In this state the limb continues for a longer or shorter time, and is commonly at length reduced wholly, or nearly to the natural size.

Hitherto the disease has been described as affecting only one of the inferior extremities, and as terminating by resolution, or the effusion of a fluid that is removed by the absorbents; but, unfortunately, it sometimes happens, that after it abates in one limb, the other is attacked in a similar way. It also happens, in some cases, that the swelling is not terminated by resolution; for sometimes a suppuration takes place in one or both legs, and ulcers are formed which are difficult to heal. In a few cases a gangrene has supervened. In some instances the patient has been destroyed by the violence of the disease, before either suppuration or gangrene have happened.

The predisposing causes of this disease, when it occurs during the pregnant or puerperal state,

or in a short time afterwards, appeared to be:
1. The increased irritability and disposition to inflammation which prevail during pregnancy, and in a still higher degree for some time after parturition. 2. The over-distended, or relaxed state of the blood-vessels of the inferior part of the trunk and of the lower extremities, produced during the latter months of utero-gestation.

Amongst the exciting causes of this disease may be enumerated: 1. Contusions, or violent exertions of the lower portions of the abdominal and other muscles inserted in the pelvis or thighs, or of the muscles of the inferior extremities, and contusions of the cellular texture connected with these muscles during a tedious labour. 2. The application of cold and moisture, which are known to act very powerfully upon every system in changing the natural distribution of the circulating fluids, and consequently in a system predisposed by parturition, may assist in producing the disease, by occasioning the fluids to be impelled in unusual quantity into the weakened vessels of the lumbar, hypogastric, and inguinal regions, and of the inferior extremities. 3. Suppression, or diminution of the lochia, and of the secretion of milk, which, by inducing a plethoric state of the sanguiferous system, may occasion an inflammatory diathesis, may favour congestion, and the determination of an unusual quantity of blood to the vessels of the parts just mentioned, and thus contribute to the production of an inflammation of these parts. 4. Food taken in too large quantity, and of a too stimulating quality, especially when the patient does not give suck. This cause both favours the production of plethora, and stimulates the heart and arteries to more frequent and violent action; the effects of which may be expected to be particularly felt in the lumbar, hypogastric, or inguinal regions, and in the lower extremities, from the state of their blood vessels. 5. Standing, or walking too much, before the arteries and veins of the lower half of the body have recovered sufficiently from the effects of the distention, which existed during the latter months of pregnancy. This must necessarily occasion too great a determination of blood to these parts, and consequently too great a congestion in them; whence they will be more stimulating than the upper parts of the body, and inflammation will sometimes be excited in them.

From an attentive consideration of the whole of the phenomena observable in this disease, and of its remote causes and cure, no doubt remains, Dr. Hull thinks, that the proximate cause consists in an inflammatory affection, producing suddenly a considerable effusion of serum and coagulating lymph from the exhalants into the cellular membrane of the limb.

PHLEGMASIE. Inflammations. The second order in the class pyrexiae of Cullen's nosological arrangement, characterized by pyrexia, with topical pain and inflammation; the blood after venesection exhibiting a buffy coat. See **MEDICINE**.

PHLEGMATIC. *a.* (φλεγματικός.) 1. Abounding in phlegm (*Arb.*). 2. Generating phlegm

(*Brown*). 3. Watery (*Newton*). 4. Dull; cold; frigid (*Southern*).

PHLEGMON. (*phlegmone*, φλεγμονή, from φλεγω, to burn.) An inflammation of a bright red colour, with a throbbing and pointed tumour tending to suppuration. A species of phlogosis of Cullen.

PHLEGMONOUS. *a.* (from *phlegmon*.) Inflammatory; burning (*Harvey*).

PHLEGON, who was surnamed Trallianus, was born in Trallis, a city of Lydia. He was the emperor Hadrian's freedman, and lived to the 18th year of Antoninus Pius; as is evident from his mentioning the consuls of that year. He wrote several works of great erudition, of which we have nothing left but fragments. Among these was a History of the Olympiads, a Treatise of Long-lived Persons, and another of Wonderful Things; the short and broken remains of which Xylander translated into Latin, and published at Basil in 1568, with the Greek and with notes. Meursius published a new edition of them with his notes at Leyden, in 1622. The titles of part of the rest of Phlegon's writings are preserved by Suidas. It is supposed that the history of Hadrian, published under Phlegon's name, was written by Hadrian himself, from this passage of Spartianus: "Hadrian thirsted so much after fame (says he), that he gave the books of his own life, drawn up by himself, to his freedmen, commanding them to publish those books under their own names; for we are told that Hadrian wrote Phlegon's books."

PHLEGRA, or **PHLEGREÆUS CAMPUS**, a place of Macedonia, where the giants attacked the gods, and were defeated by Hercules. The combat was afterwards renewed in Italy, in a place of the same name near Cumæ, &c.

PHLEGYÆ, a people of Thessaly. Some authors place them in Bœotia. They received their name from Phlegyas, the son of Mars, with whom they plundered and burned the temple of Apollo at Delphi.

PHLEGYAS, in fabulous history, a son of Mars, king of Lapithæ in Thessaly. He was father of Ixion and Coronis, to whom Apollo offered violence. When he heard that his daughter had been abused, he marched an army against Delphi, and reduced the temple of the god to ashes. Apollo, in resentment, killed Phlegyas, and placed him in hell, where a huge stone hangs over his head.

PHLEME. *s.* (from *phlebotomy*.) An instrument for letting blood, which is placed on the vein and driven into it with a blow.

PHLEUM. Cat's-tail; Timothy grass. In botany, a genus of the class triandria, order digynia. Calyx two-valved, one-flowered, sessile, linear, truncate, ending in a point, inclosing, and longer than the corol. Five species; four of them common to the pastures, mountains, meadows or sea-marshes of our own country; and cultivated as a useful food for cattle. See **HUSBANDRY**.

PHLOAS, in zoology, a genus of the class vermes, order testacea. Animal an ascidia; shell bivalve, divaricate, with several less diffe-

rently shaped accessory ones at the hinge; hinges recurved, united by a cartilage; in the inside beneath the hinge is an incurved tooth. The inhabitants of this genus perforate clay, spongy stones and wood, while in their younger state; and as they increase in size enlarge their habitation within, and thus become imprisoned: they contain a phosphorous liquor of great brilliancy in the dark, and which illuminates whatever it touches or happens to fall upon.

It is equally extraordinary by what means this curious worm is able to burrow and work its way in the midst of massy stones, as the nature of the phosphorous light which it so copiously secretes. The organ by which it appears to work is a fleshy substance placed near the lower extremity of the shell, of the shape of a lozenge, and considerably large in proportion to the size of the animal; it is by perseverance alone, therefore, and by great length of time that it is able to scoop out an augmentation to the cavity it inhabits. The minute opening by which the worm, when very small, insinuated itself into the interior of the substance it inhabits is generally to be traced, and at once subverts the absurd opinion of those who have asserted that the phloas is at first hatched in these holes.

The light emitted is of a very peculiar kind. Its existence has been long known, for it is noticed by Pliny, who observes that it shines in the mouth of the person who eats it, and makes him luminous if it touch but his hand or clothes. Putrescency, though not putrefaction, is necessary for the discharge of the light possessed by phosphorescent fishes; in the phloas, on the contrary, the light is rendered brighter in proportion to the freshness of the animal. The moisture of salt or fresh water revives it; brandy suddenly extinguishes it; vinegar not quite so soon. It is probable that this worm often contributes to the luminous appearance of the sea.

Various experiments have been made to render the light or luminous matter secreted by the phloas permanent, but none have altogether succeeded. Reaumur kneaded the juice into paste with flour, and found that the paste would give light when immersed in warm water. But the best way to preserve the light is to preserve the worm, or fish as it is usually called, in honey, in which state whenever taken out and plunged into warm water, it will give a very brilliant light for a twelvemonth afterwards. Milk, however, appears to be rendered more luminous by this phosphorous matter than any other liquid; a single phloas made seven ounces of milk so luminous that the faces of persons in the dark could be seen and distinguished by it.

There are twelve species of this curious animal; three of which are common to the seas of our own coast. We shall select a specimen or two.

1. *P. dactylus*. Shell oblong, with reticulate, subspinous striæ on the upper part. Inhabits among the rocks of Europe; and luminous by night; entirely white, with sometimes an ochraceous cast, thin, fragile, elongated, and

wedge-shaped on the fore-part, convex behind; the margin inflected; marked with subspinous striæ, which become gradually more indistinct; hinge resembling a spoon; accessory valves four.

2. *P. pusilla*. Shell oblong, rounded, with arched striæ; white or brownish. Inhabits America and India, and penetrates the bottoms of ships.

3. *P. hians*. Shell bivalve, white, with transverse arched striæ; above connivent; convex in the middle; beneath wedge-shaped, with a very large oval aperture. Inhabits the American islands, and perforates calcareous rocks and corals.

PHLOGISTIC SYSTEM. Becher was the first chemist who adopted a separate principle of inflammability, by which he explained, not only the action of fire, and the combustion of bodies, but many of the most remarkable phenomena in chemistry at that time known. He considered it as an element, and like his two others, of the nature of earth; for which reason he termed it his second or inflammable earth. Stahl determined this notion of the inflammable principle more accurately, and gave it the name of phlogiston. But he differed from the opinion of his tutor, with respect to the nature of this substance, which he asserted to be a sulphureous principle. According to him, it exists in all the bodies of the three kingdoms, in a greater or less proportion, water, simple earths, and salts excepted.

It is phlogiston alone that constitutes the combustible part in inflammable bodies, or in the words of Stahl, "*est solum ad ignis motum accommodatum, creatum et aptum; est ignis corporeus, vel ipsa præcise propria materies ignis.*" Phlogiston nevertheless does not itself, without being combined with other bodies, form fire, "*sed avolat et dissipatur in tenuitate insensibili, sive facit dumtaxat ignem valde expansum et inconspicuum, scilicet calorem;*" but, also, this volatilization and dissipation cannot take place without the access of other matter, especially water and air.

After phlogiston has, combined in a greater or less proportion with the other natural bodies, it changes their external, and, chiefly, their chemical properties. Its action is most conspicuous upon metals, sulphur, colours, and odoriferous substances.

But, when chemistry became enriched with a multitude of new facts, it was found that Stahl's established theory of phlogiston could not explain every phenomenon: Chemists, therefore, endeavoured to render it more definite, and, at the same time, more general in its application. But in these definitions we observe the utmost disagreement; and almost every author differs on this subject.

PHLOGISTON. (from φλογίζω, to burn or inflame.) The principle of combustion upon the theory of Stahl, and which the variable and uncertain state of present chemistry renders it proper that instead of totally exploding, we should still keep in view, and compare with the newest discoveries.

PHLOGISTON.

The process of combustion, which is one of the most striking and most familiar of all the natural phenomena, has for ages engaged the attention of philosophers. For our purpose, however, and limited as we are to a small space which we must make the most of, it will be sufficient to observe that there have been at least three hypotheses in modern times to account for combustion, together with several modifications of each. The first in order of date is the phlogistic theory which was brought to a very ingenious system by Stahl, who is generally looked upon as its author. This able philosopher supposes that all inflammable bodies (or such as burn with emission of light and heat) contain a portion of an intangible and imponderable substance called phlogiston, to which they owe their inflammability with all its attendant phenomena. Whilst a body is burning, it parts with this phlogiston, which passes into combination with the ambient air; and by this means it is usually reduced to an ash; but if a metal, to a calx or oxyd; either of which differs from the original substance in merely being deprived of phlogiston. And hence (to take a metal as an example) in order to reduce the calx or oxyd to the metallic state, it is necessary to unite it with some inflammable substance, such as charcoal, which restores its phlogiston, and brings it back to the metallic or reguline state.

But this ingenious hypothesis was made before the discovery of oxygen, and before the precise agency of air in maintaining combustion was understood, and hence the several modifications made to all the then known chemical facts were essentially defective.

The discovery of oxygen by Dr. Priestley followed at no great length of time, which gave rise to the admirable and beautiful researches of Lavoisier on the subject of combustion, in which this excellent philosopher demonstrated that in all cases of combustion, the inflammable substance united with oxygen, and produced either an acid, or an oxyd, or water, or a mixture of these three; and that the weight of the product above that of the simple combustible was exactly equal to the quantity of oxygen that had disappeared. In this respect, therefore, the system so finely brought out by Lavoisier was not so much an improvement of Stahl's as an essential addition to it, and all other previous theories, by accounting for the increase of weight of the product of combustion over that of the combustible. But combustion implies (as we have already noticed on that article) the disengagement of light and heat, which was still to be explained, and this was done by Lavoisier to the exclusion of phlogiston (the existence of which was at all times very problematical), by supposing oxygen gas to be a compound of oxygen with heat and light; and hence whilst a body burns, according to Lavoisier, it absorbs oxygen from the air, separating it from the heat and light with which it was united, and which then appear in the separate form of fire. This system therefore allows of no other difference between combustion and

slow oxygenation than that in the former case, the process advancing rapidly, the heat and light separated from the oxygen gas appear in the form of visible flame, and in the latter they escape slowly and imperceptibly to the senses.

From the way in which Lavoisier expresses himself, however, it might be supposed that he conceived that the only portion of caloric which could be set free during combustion was that which is essential to the gaseous form, or that which makes the sole difference between a solid body and the same body gassified, analogous to the difference in this respect between steam and fluid water. Hence it would follow that no oxygen in solid or liquid combination could maintain combustion, a position which is instantly refuted by the well-known power of the solid oxygen of nitre and oxymuriat of potash to inflame charcoal, or the liquid oxygen of nitric acid to enkindle essential oils.

If, therefore, oxygen be the source of the heat disengaged during combustion (which is extremely probable) it must be allowed in several instances to carry the greater part of its heat with it into various combinations, so that the oxygen of nitric acid which can support combustion must be allowed to be different from that of water (for example) which cannot: and nitric acid, therefore, must be called a compound of nitrogen and of oxygen with its caloric; and water a compound of hydrogen and of oxygen without its caloric. This distinction has been well pointed out by Brugnatelli, who terms the former state thermoxygen and the latter simple oxygen.

It is a presumptive argument, too, that the heat given out during combustion is chiefly derived from the oxygen, that the increase of temperature is generally pretty accurately proportioned to the quantity of oxygen consumed, as was found by Lavoisier and La Place in their experiments with the calorimeter.

Several objections of weight, however, oppose the hypothesis that light is also a constituent part of oxygen gas, or of oxygen in any state fit to support combustion. One of the strongest is that the quantity of light given out in this process is not proportioned to the quantity of heat, and the circumstance of the various colours which the flame assumes, according to the nature of the combustible body, would seem rather to indicate that it is this latter, and not the oxygen gas, which is the principal source of the light. This opinion has therefore been adopted by several chemists of late years, among whom are Gren, Brugnatelli, and Dr. Thomson: and according to this system, the process of combustion is in fact a double decomposition, in which the combustible body unites with oxygen to form an oxyd, or water, or an acid, according to circumstances, while the light of the combustible combines with the caloric of the oxygen, and produces the flame or fire.

It will be easily seen that this system in one part bears a resemblance to the ancient hypothesis of phlogiston, inasmuch as both of them

suppose a something to be contributed by the combustible body itself towards the composition of the fire or flame, and this too appears on the whole more consonant with the general phenomena of combustion and oxygenation. But still there remain a vast number of difficulties to be cleared up before it can be fully admitted. The late very ingenious and very important series of experiments by Mr. Davy tend indeed to re-conduct us in a very considerable degree to the original foundation of the phlogistic theory, for they seem to indicate the existence of a distinct inflammable principle that pervades all nature; and could we get over the difficulty of the utter imponderability of this principle upon the Stahl hypothesis, we apprehend it would not be long before it would be once more embraced in all its essential doctrines.

PHLOGOSIS. (φλογωσις, from φλογω, to inflame.) See **INFLAMMATION**.

PHLOMIS. Sage-tree; Jerusalem sage. In botany, a genus of the class didynamia, order gymnospermia. Calyx angular; upper lip of the corol incumbent, compressed, villous. Twenty-seven species; natives of the south of Europe, Asia, or the Cape. The following are cultivated.

1. *P. fruticosa*. Common Jerusalem sage.
2. *P. purpurea*. Sharp-leaved, purple phlomis.
3. *P. Italica*. Blunt-leaved, purple phlomis.
4. *P. lychnitis*. Sage-leaved phlomis.
5. *P. laciniata*. Jagged-leaved phlomis.
6. *P. tuberosa*. Tuberous phlomis.
7. *P. Zeylanica*. White phlomis.
8. *P. nepetifolia*. Catmint phlomis.
9. *P. leonurus*. Narrow-leaved phlomis.
10. *P. leonitis*. Dwarf-shrubby phlomis.

All the tribe have perennial roots, and many of them perennial stalks. The latter rise from two to five or six feet high, and are adorned with yellow, blue or purple flowers in whorls. They are all ornamental; most require a greenhouse, but a few will bear the external air in a sheltered situation.

PHLOX. Lychnidea, or bastard lychnis. In botany, a genus of the class pentandria, order monogynia. Corol salver-shaped, filaments unequal; stigma three-cleft; calyx prismatic; capsule three-celled, one-seeded. Twelve species, all North American plants. The following are cultivated.

1. *P. paniculata*. Panicle lychnidea.
2. *P. suaveolens*. White-flowered lychnidea.
3. *P. maculata*. Spotted-stalked lychnidea.
4. *P. pilosa*. Hairy-leaved lychnidea.
5. *P. Carolina*. Carolina lychnidea.
6. *P. glaberrima*. Smooth lychnidea.
7. *P. divaricata*. Early-flowering lychnidea.

The plants of this genus have perennial roots with herbaceous stalks from nine inches to two feet in height, adorned with tubulated flowers of a white or purple colour. They are propagated by offsets, and will bear the winter of our own country.

PHLYCTÆNÆ. (φλυκταιναι, small blad-

ders.) Small pellucid vesicles, that contain a serous fluid.

PHLYZACIUM. (φλυζακιον, from φλυζω, to be hot.) A pustule on the skin excited by fire or heat. See **PUSTULE**.

PHOCA. Seal. In zoology, a genus of the class mammalia, order fereæ. Fore-teeth acute, upper six, parallel, outer ones larger; lower six, parallel, distinct, equal, obtusish; tusks twice as long, acute, robust, solitary, the upper remote from the fore-teeth, the lower from the grinders; grinders five or six, narrow, tricuspidate; earless; hind-feet fettered.

This is a dirty, curious, quarrelsome tribe, easily tamed, and polygamous; flesh succulent, tender; fat and skin useful; they inhabit and swim under water, and crawl on land with difficulty, because of their retracted fore-feet, and united hind-feet; feed on fishes and marine productions, and swallow stones to prevent hunger, by distending the stomach.

1. *P. vitulina*. Sea calf. Head without neck, smooth; body brown; large black eyes; large whiskers; oblong nostrils; a flat head and nose; tongue forked at the end. It has six cutting teeth in the upper jaw, four in the lower; a short tail; body covered with thick short hair; toes furnished with strong sharp claws; usual length from five to six feet; colour various; dusky, brindled, or spotted with white or yellow. Inhabits most quarters of the globe, but in greatest numbers towards the north and south. They swarm near the Arctic circle, and in the lower parts of South America, in both oceans. They are also found in the Caspian sea, in the lake Aral, in the Baikal and Oron. Those in the fresh water lakes are less than those that frequent the salt water.

These seals produce two young at a time. They bring forth in autumn, and suckle their young, which are white and woolly, in caverns, or in rocks, till they are six or seven weeks old, when they take them to sea. They cannot continue long under water; and are therefore very frequently obliged to rise to take breath, and often float on the waves. In summer they sleep on rocks, and on sand banks; if surprised, they hasten to the sea; if at any distance from it, they scramble along and fling up the sand, and small stones, with great force with their hind-feet, making a piteous moaning: if overtaken, they offer a vigorous defence with their feet and teeth. A slight blow on the nose kills them; otherwise they will bear a multitude of wounds. They swim with vast strength and swiftness; frolic greatly in their element, and sport without fear about ships and boats, which may have given rise among the ancients to the fables of sea nymphs and sirens. They never go to any great distance from the land; feed on all sorts of fishes, and are themselves good food, and often eaten by voyagers: but they are generally killed for the sake of the oil made from their fat: a young seal will yield eight gallons. Their skins are used for waistcoats, covers for trunks, and other conveniences. Seals are the wealth of the

Greenlander, supplying him with every necessary of life. This species is the phoca of the Roman writers.

2. *P. mutica*. Long-necked seal. Body slender; its length from the nose to the fore-legs equal to that from the fore-legs to the tail; fore-feet resemble fins, and have no claws.

3. *P. Australis*. Falkland Isles seal. Ears short, pointed; about four feet long; covered with short ashcoloured hair, tipped with dirty white; nose short and beset with strong black bristles; no claws on the fore-feet; but on the toes of the hind-feet four, long and straight. These are found also as far distant as New Zealand.

4. *P. testudo*. Tortoise seal. Head resembling a tortoise; neck slenderer than its head and body; its feet are like those of the common seal. It is said to be found on the shores of many parts of Europe; but the species is very little known.

5. *P. fasciata*. Ribbon seal. Short fine bristly hair, of an uniform colour, almost black, marked along the sides, and towards the head and tail, with a stripe of a pale yellow colour, exactly resembling a ribbon, laid on it by art; sometimes resembling harness. Inhabits the Kurile Islands.

6. *P. laniger*. Leporine seal. Covered with fur, soft as that of a hare, upright and interwoven, of a dirty white colour; whiskers long and thick, so that the animal appears bearded; head long; upper lip thick: has four cutting teeth both above and below; and nails on both the fore and hind-feet: usual length six feet and a half; greatest circumference five feet two. Inhabits the White Sea during the summer; and is found also off Iceland, and on the coast of Spitzbergen.

7. *P. barbata*. Great seal. Head smooth, without ears; body blackish: grows to the length of twelve feet. Inhabits the north of Scotland, and the south of Greenland.

8. *P. hispida*. Rough seal. Head smooth, without ears; body covered with bristly hair of a pale brown, intermixed like that of a hog. Inhabits Greenland. The natives make garments of the skin, turning the hairy side inmost.

9. *P. monachus*. Hooded seal. Head without ears; hind-feet without nails; has a strong folded skin on its fore-head, which it can fling over its eyes and nose, to defend them against stones and sand in stormy weather: hair white, with a thick coat of black wool under it, which makes it appear of a fine grey. Inhabits only the south of Greenland and Newfoundland. The hunters say they cannot kill it till they remove the hood or integument on the head.

10. *P. Groenlandica*. Harp seal. Head smooth, without ears; pointed head; and thick body, of a whitish grey colour, marked on the sides with two black crescents, the horns pointing upwards towards each other. It attains this mark only in its fifth year; till which period it changes its colour annually, and is called by different names each year. It in-

habits Greenland, Newfoundland, Iceland, the White Sea, and Frozen Ocean, and passes through the Asiatic Strait as far as Kamchatka. It is the most valuable kind of any, both for its skin and oil. It grows to the length of nine feet.

11. *P. psilla*. Little seal. Head smooth, with the appearance of ears; body brown. About two feet four inches long, has soft smooth hair, longer than that of the common seal, dusky on the head and back, and brownish beneath; teeth above bifurcated; two of them below three-pointed.

12. *P. ursina*. Sea-bear; Ursine seal. Head with external ears. There are three marine animals, which keep a particular situation, and seem divided between the N.E. of Asia and the N.W. of America. These are what are called the sea-lion, the sea-bear, and the manati. Like the sea-otters, they are confined to the narrow seas, between lat. 50 deg. and 56 deg. They are also common in New Zealand, about Staten Island and the Falkland Islands. Mr. Pennant suspects they may also resort to Juan Fernandez.

The ursine seal is a name which Mr. Pennant has substituted for that of the sea-bear. These animals lead, during the three summer months, a most indolent life! They arrive at the islands prodigiously fat; but during the above time they are scarcely ever in motion. They confine themselves for whole weeks to one spot, sleep a great part of the time; eat nothing; and except the employment the females have in suckling their young, they are totally inactive. They live in families; each male has from eight to fifty females, whom he guards with the jealousy of an eastern monarch; and though they lie by thousands on the shores, each family keeps itself separate from the rest; and sometimes, with the young and unmarried ones, amount to a hundred and twenty. The old animals, which are destitute of females, or deserted by them, live apart, and are excessively splenetic, peevish, and quarrelsome. The whole tribe are extremely fierce; and so attached to their old haunts, that they would die sooner than quit them. If another approach their station, or attempt to seduce a female, they are roused from their indolence, and a battle ensues; in the course of the conflict they perhaps intrude on the seat of a third: this gives new cause of offence, so that in the end the discord becomes universal, and is spread along the whole shore; but excepting in such cases the battle is fought fairly combatant with combatant.

The wounds they give and receive are very deep, and resemble the cuts of a sabre. At the end of a fight they fling themselves into the sea, to wash away the blood.

The males are very fond of their young, but very tyrannical towards the females: if a man attempt to take one of their cubs, the male stands on the defensive, while the female makes off with the young in her mouth; should she drop it, he instantly quits the enemy, falls on

her, and beats her against the stones till he leaves her for dead. As soon as she recovers, she comes in the most suppliant manner to the male, crawls to his feet, and washes them with her tears; while he in the mean time stalks about in the most insulting manner; but in case the young one is carried off, he melts into the deepest affliction, shews every sign of deep concern, and sheds tears plentifully. The female brings but one at a time generally, never more than two.

They swim very swiftly, at the rate of seven miles an hour, and can continue a long time under water. They are very tenacious of life, and will live for a fortnight after receiving such wounds as would immediately destroy almost any other animal. The male is vastly superior in size to the female. The body of each is of a conic form, very thick before, and tapering to the tail. The length of a large male is eight feet, circumference five; near the tail twenty inches; weight 800 pounds. The nose projects like that of a pug dog, but the head rises suddenly; the nostrils are oval, divided by a septum; the lips thick; their insides red and serrated; the whiskers long and white; the teeth, in all thirty-six, lock into each other when the mouth is closed; the tongue is bifid; the eyes large and prominent; the iris black; the pupil emerald; the eyes may be covered at pleasure with a fleshy membrane: ears small, sharp-pointed; hairy without, smooth and polished within.

The length of the fore-legs is twenty-four inches; like those of other quadrupeds, and not immersed in the body like those of other seals. The feet are formed with toes, but are covered with a naked skin, having only the rudiments of nails on five latent toes. The hind-legs are twenty-two inches long, fixed to the body, but capable of being brought forward; so that the animal can use them to scratch its head. These feet are divided, each into five toes, connected with a great web, a foot broad; the tail is only two inches long.

The hair is long and rough, with a soft down of a bay colour beneath. The hair on the neck of the old males stands erect. The general colour of these animals is black; but the hair of the old ones is tipped with grey. The females are cinereous. The skins of the young ones cut out of their dams are very useful for cloathing, and cost about 3s. 4d. each; the skin of an old one 4s. The fat and flesh of the old males is very nauseous; but that of the females resembles lamb. The young ones roasted are as good as sucking pigs.

13. *P. leonina*. Bottle-nosed seal. Body brown; head crested on the fore-part; snout of the male projecting five or six inches below the lower jaw: the upper part a loose wrinkled skin, which the animal, when angry, has the power of blowing up, so as to give the nose an arched appearance; feet short and dusky, with five toes on each, furnished with nails; hind-feet with the appearance of great laciniated fins; eyes large; great whiskers; short dun hair on the body; that on the neck a little longer;

skin very thick: the old males twenty feet in length, and fifteen in circumference.

The female has a blunt nose, tuberculous at the top; wide nostrils; a mouth breaking very little into the jaws; conic teeth; eyes oblique and small; fore-legs twenty inches long; toes with flat oblong nails. Its hind parts are divided into two great forked fins, without any tail: the whole body is covered with short rust-coloured hair. The length from the nose to the end of the fins is four yards; its greatest circumference two and a half. They inhabit the seas about New Zealand, Juan Fernandez, Falkland Islands, from S. lat. 54. deg. 40 min. The males shew little attachment, but the females are excessively fond of their young. Towards evening both male and female swim a little way to sea, the last with its young on its back. The French call both this and the ursine species by the common name of sea-wolves. One of them has been known to yield a butt of oil, and its blood to fill two hogsheds. The flesh is eatable. Lord Anson's people ate it under the denomination of beef; to distinguish it from that of one or two other species which they called lamb.

They assemble in families like the former species, but not in such numbers. The males shew equal jealousy about their females; and their combats are equally bloody. When at peace, to prevent surprise, each herd places a centinel, who gives certain signals at any appearance of danger. During the breeding season they abstain from food; and, before that is elapsed, become very lean: at other times they feed on fishes and smaller seals. See Nat. Hist. Pl. CLXVIII.

PHOCÆA, a maritime town of Ionia, in Asia minor, between Cumæ and Smyrna, founded by an Athenian colony. It received its name from Phocus, the leader of the colony, or from (*phocæ*) seals, which are found in great abundance on the coast.

PHOCENSES and ΦΟΚΙΟΙ, the inhabitants of Phocis in Greece.

PHOCION, an Athenian, celebrated for his public and private virtues. He was educated in the school of Plato, and of Xenocrates, and distinguished himself by his zeal for the public good, and his military abilities. He often checked the violence and inconsiderate measures of Demosthenes. When Philip endeavoured to make himself master of Eubœa, Phocion obliged him to relinquish his enterprize. During the time of his administration, he was always inclined to peace, though he never suffered his countrymen to become indolent. He was 45 times appointed governor of Athens, though he never solicited that high office. In his rural retreat, or at the head of the army, he always appeared barefooted, and without a cloak. His integrity as well as his temperance was highly eminent. Philip, as well as his son Alexander, attempted to bribe him, but to no purpose, and Phocion boasted in being one of the poorest of the Athenians, and in deserving the appellation of the good. It was through him that Greece was saved from an impending

war, and he advised Alexander rather to turn his arms against Persia than to shed the blood of the Greeks, who were either his allies or his subjects. Antipater, who succeeded in the government of Macedonia after the death of Alexander, also attempted to corrupt Phocion, but to no effect. But virtues like these could not long stand against the insolence and fickleness of an Athenian assembly. When the Piræus was taken, Phocion was accused of treason, and fled for safety to Polyperchon, who sent him back to Athens; where he was immediately condemned to drink the fatal poison. He took the cup with the greatest serenity, and, as he drank the fatal draught, he prayed for the prosperity of Athens. He died about 318 years B. C. having exceeded his 80th year. His merits, however, were not buried in oblivion; the Athenians repented of their ingratitude, and honoured his memory by raising him statues, and putting to a cruel death his guilty accusers.

PHOCIS, a country of Greece, bounded on the east by Bœotia, and by Locris on the west, originally extending from the bay of Corinth to the sea of Eubœa, and reaching on the north as far as Thermopylæ. Phocis received its name from Phocus, a son of Ornytion, who settled there. The inhabitants were called Phocenses. Parnassus was the most celebrated of its mountains, and Delphi the greatest of its towns. Phocis is rendered famous for a war which it maintained against some of the Grecian republics, and which has received the name of the Phocian war.

PHOCUS, son of Phocion, was dissolute in his manners, and unworthy of the virtues of his great father. He was sent to Lacedæmon to imbibe there the principles of sobriety, of temperance, and frugality. He cruelly revenged the death of his father, whom the Athenians had put to death. (*Plut.*)—2. A son of Ornytion, who led a colony of Corinthians into Phocis. He cured Antiope, a daughter of Nycteus, of insanity, and married her.

PHOCYLIDES, a Greek poet and philosopher of Miletus, flourished about 540 years before the Christian era. The poetical piece now extant, attributed to him, is not of his composition, but of another poet who lived in the reign of Adrian.

PHCEBE, a name given to Diana, or the moon, on account of the brightness of that luminary. She became, according to Apollodorus, mother of Asteria and Latona. See **DIANA**.

PHCEIDAS, a Lacedæmonian general, sent by the Ephori to the assistance of the Macedonians against the Thracians. He seized the citadel of Thebes, for which he was disgraced and banished from the Lacedæmonian army. He died B. C. 377. (*C. Nep. &c.*)

PHCEBICENA, a surname of Æsculapius, as being descended from Phœbus.

PHCEBUS, a name given to Apollo, or the sun. This word expresses the brightness and splendor of that luminary. See **APOLLO**.

PHCENICE, or **PHCENICIA**, a country of

Asia, at the east of the Mediterranean. Phœnicia, according to Ptolemy, extended on the north as far as the Eleutherus, a river which falls into the Mediterranean sea, a little below the island of Aradus, and it had Pelusium on the territories of Egypt, as its more southern boundary, and Syria on the east. Sidon and Tyre were the capital towns of the country. The invention of letters is attributed to its inhabitants, and commerce and navigation were among them in the most flourishing state. The Phœnicians were originally governed by kings. They were subdued by the Persians, and afterwards by Alexander, and remained tributary to his successors and the Romans. They were called Phœnicians from Phœnix, son of Agenor, one of their kings, or from the great number of palm-trees which grow in the neighbourhood.

There is some disagreement among authors with respect to the northern limits of this country. Ptolemy, as above remarked, makes the river Eleutherus the boundary of Phœnicia to the north; but Pliny, Mela, and Stephanus, place it in the island of Aradas, lying north of that river. Strabo observes, that some will have the river Eleutherus to be the boundary of Seleucia, on the side of Phœnis and Cœlesyria. On the coast of Phœnicia, and south of the river Eleutherus, stood the following cities; Simyra, Orthosia, Tripolis, Botrys, Ryblus, Ralæbyblus, Berytus, Sidon, Sarepta, Tyrus, Palætyrus.

Phœnicia extended, according to Ptolemy, even beyond Mount Carmelus; for that geographer places in Phœnicia not only Eedippa and Ptolemais, but Sycaminum and Dæra, which stand south of that mountain. These, however, properly speaking, belonged to Palestine. We will not take upon us to mark out the bounds of the midland Phœnicia. Ptolemy reckons in it the following towns: Arca, Palæbyblus (Old Byblus), Gabala, and Cæsaria Pania. This province was considerably extended in the times of Christianity; when, being considered as a province of Syria, it included not only Damascus but Palmyra also.

PHCENICOPTERUS. Flamingo. In zoology, a genus of the class aves, order grallæ. Bill naked, toothed, bent as if broken; nostrils linear; feet four-toed, palmate, the membranes semicircular on the fore-part; hind-toe not connected. These birds intermix the character of the anseres with that of the grallæ; they have a long neck and legs; bill large, the upper mandible carinate above, and toothed on the edge, lower compressed, transversely furrowed, and nostrils covered with a thin membrane. There are only two species, as follow.

1 **P. ruber**. Red flamingo. Quill feathers black; body smaller than that of the stork; when erect six feet high from the tip to the bill; perpetually twists its head round when eating, so that the upper mandible touches the ground; tongue covered with about twelve papillæ, which are hooked backwards and cartilaginous at the tip; head small, round; bill seven inches long, partly red, partly black, and



eroded; legs and thighs slender, and not thicker than the fore-finger of a man, yet two feet long; neck equally slender, three feet long. From this extraordinary shape, the bird is able to wade into the water, to the depth where its food is found; but, though the feet are webbed, it seldom uses them for swimming: its length from bill to tail is four feet four inches.

The plumage of the flamingo is not less remarkable than its figure, being of a bright flame-coloured red. Like all other birds of extraordinary brilliancy of colour, it is an inhabitant of the tropical and warm climates. It is found from the Mediterranean, in every district of Africa, to the Cape of Good Hope. In Congo, Angola, and Bissao, where the negroes hold them in superstitious veneration, the flamingoes have multiplied to such a degree that they are seen in thousands around their villages. Among this simple people, their society is considered as the gift of heaven, and as a protection against many of the evils of life. Whence they allow none of them to be killed, and conceive it no hardship to be continually stunned with their cries, which are heard, for near a mile, all round their habitations.

These birds, though they never venture far into the temperate or colder climates, have found means to penetrate into South America and the West Indies, where they assume the very same appearance as those in Europe. Labat gives a very curious account of the manner in which they build their nests, which, he says, consist of a heap of fat earth, or of clay, collected in a marsh, and rising about twenty inches above the water, which always covers the base. Upon the top of this pyramid, a little hollowed out for the reception of the eggs, the female sits and hatches; perched as it were, upon her rump, with her legs hanging down, like a man sitting upon a stool. Dampier also describes the ridiculous posture of these birds while hatching; which, he justly observes, arises from the enormous length of their limbs, which renders it impossible to fold them under them, like those of other birds.

The young, which are never above three in number, do not fly, till they are nearly at their full growth; but run very swiftly a few days after their exclusion from the shell. At first their plumage is of a clear grey, which, for two years, brightens gradually into its vivid igneous hue, and then acquires its full lustre. The food of the flamingo is shell-fishes, aquatic insects, and the spawn of fishes. While feeding, they keep together in large flocks, drawn up artificially in lines, which, at a distance, exactly resemble an army in order of battle; and, like all gregarious birds, they employ a few to act as centinels, for the security of the rest while feeding. On the approach of danger, these set up a loud clangor like that of a trumpet, which is heard at a great distance, and is the signal upon which the rest take wing. So shy are these birds, that, when surprised by the sudden appearance of an enemy, they remain motionless; and continue so much

overwhelmed with astonishment, that almost all the individuals of a flock may be knocked down, one after another.

Catesby, Dampier, and other travellers, speak variously concerning the flesh of the flamingo, as an article of diet; a circumstance not to be wondered at, since food appears either good or bad, in a great measure, according to the appetite of him who uses it. It was a dish in high repute among the luxurious Romans; and Apicius, so famous in the annals of gluttony, is recorded by Pliny as the person who discovered the exquisite relish of the flamingo's tongue, and a new method of seasoning it. Some of the modern travellers, probably from an affected deference to the opinion of the ancients, have spoken also in high terms of the exquisite flavour of the flamingo's tongue. It must surely prove a costly dish; and the man who would gratify himself by frequently eating it, would prove a more extensive plunderer than the most ravenous of the rapacious birds.

In some parts these birds are tamed, principally for the sake of their skins, which are covered with a very fine down, and applicable to all the purposes for which that of the swan is employed. When taken young, they grow so familiar, that, in a few days, they will eat from the hand. Even the old birds lay aside their wild habits, and submit to captivity; living in perfect harmony with the poultry, along with which they feed. But, however easily these birds submit to domestication, they are never found to thrive in that state: none of those, that have been made captives by the natives of America, have been found to breed under their care. The young are extremely tender and delicate; and even the old birds are so sensible to cold, that they approach the fire constantly in their native climates, where they have been brought into a domestic state.

Snares and lures are laid, in order to catch those that are running wild; and sometimes the natives make use of tame birds for this purpose. The method employed is, to drive the latter into the parts frequented by the wild birds, and there to lay meat for them. No sooner do the wild flamingoes see the decoys devouring the meat, than they advance to partake of it. A battle then ensues between the parties, when the bird-catchers, who lie concealed hard by, spring up, and secure them.

2. *P. Chilensis*. Chilese flamingo. Quill-feathers white; bill covered with a reddish skin; head suberected. Inhabits Chili; five feet long from the bill to the claws. See Nat. Hist. Pl. CLXIX.

PHŒNIX, *Φοινῖς*, in astronomy, a constellation of the southern hemisphere; unknown to the ancients, and invisible in our northern parts.

The number of stars in this constellation is thirteen, viz. 0.1.4.7.1.0. taking them in the order of their magnitudes.

This constellation took its name and form from those of a bird famous among the ancients; but generally looked upon by the moderns as fabulous.

The naturalists speak of this bird as single, or the only one of its kind; they describe it as of the size of an eagle; its head finely crested, with a beautiful plumage; its neck covered with feathers of a gold colour, and the rest of its body purple; only the tail white, intermixed with carnation; and its eyes sparkling like stars. They hold, that it lives five or six hundred years in the wilderness; that, when thus advanced in age, it builds itself a funeral pile of sweet wood, and aromatic gums; then it fires it with the wafting of its wings, and thus burns itself; and from its ashes arises a worm, which, in time, grows up to be another phoenix.

Hence the Phœnicians gave the name phoenix to the date palm-tree; because, when burnt down to the very root, it naturally rises again fairer than ever.

Ancient historians reckon four appearances of the phoenix; the first, in the reign of Sesostris; the second, in that of Amasis; the third, in that of the third Ptolemy; and the fourth, according to Dion Cassius, as a presage of the death of Tiberius, but Tacitus refers it to Egypt under the empire of Tiberius, and Pliny to the consulate of Quintus Plancius, which took place A. D. 36.

The ancients, however, speak of the phoenix as a fabulous bird.

The ancient Christians refer to the phoenix in some of their accounts of the resurrection.

PHŒNIX. The most celebrated of this name are the two following:—1. A son of Amyntor, king of Argos, by Cleobule, or Hippodamia, who was preceptor to young Achilles. It is said that Amyntor, jealous of his son on account of his concubine, Clytia, whose favours Cleobule urged Phoenix to solicit, actually put out the eyes of his son, upon which he meditated the death of his father. Reason and piety, however, prevailed over passion, and Phoenix, not to become a parricide, fled from Argos to the court of Peleus, king of Phthia. Here he was treated with tenderness; Peleus carried him to Chiron, who restored him to his eye-sight, and soon after he was made preceptor to Achilles, his benefactor's son. He was also made king of the Dolopes. He accompanied his pupil to the Trojan war, and Achilles was ever grateful for the precepts which he had received from Phoenix. He died in Thrace, and was buried, according to Strabo, near Trachinia, where a small river in the neighbourhood received the name of Phoenix.—2. A son of Agenor, who was, like his brothers Cadmus and Cilix, sent in pursuit of his sister Europa (see CADMUS, EUROPA); and when his enquiries proved unsuccessful, he settled in a country, from him called Phœnicia. From him, as some suppose, the Carthaginians were called Pœni.

PHŒNIX. Date-palm. Date-tree. In botany, a genus of the class dioecia, order tetrandria. Calyx three-parted; corol three-petalled. Male: anthers linear, four-sided. Female: pistil one; drupe ovate; seed solitary. Two species.

1. *P. farinifera*, an East Indian tree with pinnate fronds longer than the trunk.

2. *P. dactylifera*. Pinnate fronds shorter than the trunk: a native of Arabia and Persia. The trunk rises to sixty, eighty, or a hundred feet high; the stalks are generally full of rugged knots, which are the vestiges of the decayed fronds, for the trunks of these trees are not solid, but the centre is filled with pith, around which is a tough bark full of strong fibres while young, but as the tree grows old this bark hardens and becomes woody; to it the fronds are closely joined, and rise erect in the centre, being closely folded, or plaited together; but after they are advanced above the sheath which surrounds them they expand very widely on every side of the stem, and as the older fronds decay the stalk advances in height; the fronds when grown to a size for bearing fruit are six or eight feet long, and may be termed branches (for the tree has no other); these have narrow long pinnae set alternately on their whole length; the small lobes are towards the base, three feet long, and little more than one inch broad; they are closely folded together when they first appear, and are wrapt round by brown fibres or threads, which fall off as the foliage advances, making way for its spread. These pinnae never open flat, but are hollow like the keel of a boat, with a sharp ridge on their back; they are very stiff, and when young of a bright green, terminating in a sharp black spine.

It is necessary for fructification that male trees grow near the female, or those that produce fruit: the flowers of both sexes issue from the trunk in very long branches, and are covered with a spath or sheath which opens and withers: those of the male have six short stamens with narrow four-cornered anthers filled with farina. The female flowers have no stamens, but have a roundish germ which afterwards becomes an oval berry, with a thick pulp inclosing a hard oblong drupe with a deep furrow running longitudinally: the bunches of fruit are sometimes very large.

The berries of this tree are the dates of the shops, which are imported into our own country from the Levant.

The cultivation of the date-tree has been tried in Jamaica, but does not flourish well; and there are but few of them growing in the island at present. The fruit of the tree cultivated in Spain and France looks well to the eye, but seldom becomes thoroughly ripe. In our own country the tree is sometimes raised from exotic seeds, as a green-house plant, but it never arrives at sufficient perfection to produce either fruit or flower.

Though the date-tree grows every where on the northern coasts of Africa, it is seldom carefully cultivated except beyond mount Atlas; for the heat is not sufficiently powerful along the coasts to bring the fruits to proper maturity. To the inhabitants of all that part of Zaara which is near mount Atlas, the only part of the desert indeed which is inhabited, the date-tree supplies the place of corn, which grows

with great difficulty, and will scarcely produce either barley or maize. The trees are here planted without any order, at the distance of twelve feet from each other, males intermixed with females, in the neighbourhood of rivulets and streams that issue from the sand.

There is scarcely any part of the date-tree which is not useful. The wood, though of a spongy texture, lasts such a number of years, that the inhabitants of the country say it is incorruptible. They employ it for making beams and instruments of husbandry; it burns slowly, but the coals which result from its combustion are very strong, and produce a great heat. The Arabs strip the bark and fibrous parts from the young date-trees, and eat the substance, which is in the centre; it is very nourishing, and has a sweet taste; it is known by the name of the marrow of the date-tree. They eat also the leaves, when they are young and tender, with lemon juice; the old ones are laid out to dry, and are employed for making mats and other works of the same kind, which are much used, and with which they carry on a considerable trade in the interior parts of the country. From the sides of the stumps of the branches which have been left arise a great number of delicate filaments of which they make ropes, and which might serve to fabricate cloth.

A white liquor, known by the name of milk, is drawn also from the date-tree; to obtain it, all the branches are cut from the summit of one of these trees, and after several incisions have been made in it, they are covered with leaves, in order that the heat of the sun may not dry it. The sap drops down into a vessel placed to receive it, at the bottom of a circular groove made below the incisions. The milk of the date-tree has a sweet and agreeable taste when it is new; it is very refreshing, and is given to sick people to drink, but it generally turns sour at the end of 24 hours. Old trees are chosen for this operation, because the cutting of the branches, and the large quantity of sap which flows from them, greatly exhaust them, and often cause them to decay. The male flowers of the date-tree are also useful. They are eaten when still tender, mixed up with a little lemon juice. They are reckoned to be very provocative; the odour which they exhale is probably the cause of this property being ascribed to them. These date-trees are very lucrative to the inhabitants of the desert. Some of them produce twenty bunches of dates; but care is always taken to lop off a part of them, that those which remain may become larger; ten or twelve bunches only are left on the most vigorous trees. It is reckoned that a good tree produces, one year with another, about the value of ten or twelve shillings to the proprietor. A pretty considerable trade is carried on with dates in the interior part of the country, and large quantities of them are exported to France and Italy. The crop is gathered towards the end of November. When the bunches are taken from the tree, they are

hung up in some very dry place, where they may be sheltered and secure from insects.

Even the stones, though very hard, are not thrown away. They give them to their camels and sheep as food, after they have bruised them, or laid them to soften in water.

The date, as well as other trees which are cultivated, exhibits great variety in its fruit, with respect to shape, size, quality, and even colour. There are reckoned to be at least twenty different varieties. Dates are very liable to be pierced by worms, and they soon corrupt in moist or rainy weather.

From what has been said, it may easily be perceived that there is, perhaps, no tree whatever used for so many and so valuable purposes as the date-tree.

PHOLAS. See **PHLOAS**.

PHOLUS, one of the Centaurs, who kindly entertained Hercules when he was going against the boar of Erimanthus; but he refused to give him wine, which belonged to the rest of the Centaurs. Hercules, without ceremony, broke the cask. The smell of the liquor drew the Centaurs to the house of Pholus, but Hercules killed the greatest part of them. Pholus intertered the slain, but he mortally wounded himself with one of the arrows poisoned with the venom of the hydra, which he attempted to extract from the body of one of the Centaurs. Hercules, unable to cure him, buried him when dead, and called the mountain where his remains were deposited by the name of Pholoe.

PHONICS. (from *φωνη*, voice or sound.) The doctrine or science of sounds. See **ACOUSTICS**. This science has been considered as analogous to that of optics, and is divided into direct, refracted, and reflected; these have been called phonics, diaphonics, and cataphonics; but the terms are now well nigh obsolete. Phonics is a science that may be improved with regard to the object, the medium, and the organ. The object may be improved with respect to the production and propagation of sounds. With regard to the medium, phonics may be improved by its thinness and quiescence, and by the sonorous body being placed near a smooth wall, either plain or arched, more especially if it be formed after some peculiar curve, as from this arises the theory and practice of whispering places. Sound is much sweetened if it is propagated in the vicinity of water, and on a plain it will be conveyed much further than on uneven ground.

PHONOCA'MPTIC. *a.* (*φωνη* and *καμπηλω*.) Having the power to inflect or turn the sound, and by that means to alter it (*Derham*).

PHORCUS, or **PHORCYS**, a sea deity, son of Pontus and Terra, who married his sister Ceto, by whom he had the Gorgons, the dragon that kept the apples of the Hesperides, and other monsters.

PHORMIS, an Arcadian, who acquired great riches at the court of Gelon and Hiero, in Sicily. He dedicated the brazen statue of a mare to Jupiter Olympus, in Peloponnesus,

which so much resembled nature, that horses came near it, as if it had been alive.

PHORMIUM. Flax-plant. In botany, a genus of the class hexandria, order monogynia. Corol six-petalled, inferior; the three inner petals longer; calyxless; stamens ascending, exerted; capsule oblong, three-sided; seeds oblong, compressed. One species, a native of New Zealand.

P. tenax. The leaves resemble those of flax; the flowers are in one variety yellow, in another a deep red. Of the leaves of this plant the New Zealanders, with very little preparation, make all their common apparel, and also their strings, lines, and cordage for every purpose, as well as the whole of their canvas and matting, all which are prodigiously stronger than any thing we can manufacture from hemp. From the same plant, by another preparation, they draw long slender fibres which shine like silk and are as white as snow. Of these, which are also very strong, they make their finest cloths; and of the leaves, without any other preparation than splitting them into proper breadths and tying the strips together, they make their fishing nets, of which some are of an enormous size. The seeds of this valuable plant have been brought over into England, but upon trial were not found to vegetate. It does not appear to us, however, that a fair or sufficient trial has ever been given; and it is probable that the seeds, however torpid, might be made to germinate if infused for an hour or two, antecedently to their being put into garden pots, in a solution of oxymuriatic acid.

PHOSOXYGEN (from $\phi\omega\varsigma$, light, and $\sigma\acute{\upsilon}\nu$, and $\gamma\epsilon\eta\epsilon\iota\varsigma$, oxygen), a term coined by Mr. Davy to express more accurately that compound which Lavoisier has denominated, and which is usually called after him oxygen gas, as being supposed to have oxygen and caloric for its constituent ingredients; but which, in opposition to M. Lavoisier, Mr. Davy conceives to be a combination of oxygen and light, without any caloric whatever, properly so called.

We believe we are now, for the first time, introducing this term into any work of general science; yet the frequency of its recurrence in the writings of Mr. Davy, and the importance of the supposed compound itself to the general train of his reasoning on a variety of physiological as well as of chemical subjects, render it necessary that we should make our readers acquainted with it.

In effect phosoxxygen, or the union of oxygen and light, forms the very basis of this ingenious philosopher's theory of respiration. Having laid it down as a fact that caloric does not exist as a substance *sui generis*, or in any other manner than as a peculiar motion, perhaps a vibratory motion of the corpuscles of bodies tending to separate them, and, consequently, that it consists in repulsive motion; and having endeavoured to establish that light does exist in a state of union with oxygen, and that the substance denominated oxygen gas is this very compound, he ultimately determines that the chemical process of respiration consists in the combina-

tion of phosoxxygen with the venous blood in the lungs, and in the liberation of carbonic acid and of aqueous gass from it. From this combination and decomposition arises an increase of repulsive motion, which, combined with that produced by the other chemical processes taking place in the system, and that generated by the reciprocal action of the solids and fluids, is the cause of animal heat.

In opposition to the Lavoisierian theory, which accounts for the conversion of the deep Modena hue of the venous blood in the lungs into a bright scarlet by the iron contained in the blood being transformed into a red oxyd, through the slow combustion produced by the action of the caloric and oxygen, introduced into the lungs from the atmosphere in every act of inspiration, he asserts,

1st. That iron never decomposes phosoxxygen (oxygen gass, or oxygen and caloric) at so low a temperature as 98 degrees, the greatest heat of the lungs; nor in any circumstances below rapid combustion, flame, and intense heat.

2d. Oxygen is never decomposed by carbon (as the carbon of the blood) at so low a temperature as 98 degrees, nor ever decomposed, in like manner, below rapid combustion, flame, and intense heat.

3d. Oxygen gass, or phosoxxygen, is never decomposed by hydrogen at so low a temperature as 98 degrees; and that, as above, this process never takes place without flame.

And in direct opposition to the propositions thus negated; he contends, affirmatively,

1st. That phosoxxygen combines, in an undecomposed state, with the venous blood in the lungs; and,

2d. That carbonic acid and water are both liberated from the lungs during this process, either by the increase of temperature, or from the superior affinity of phosoxxygen for the venous blood.

The experiments upon this subject are highly ingenious, and the reasoning is at least plausible; but the subject of respiration, like that of combustion, is still left in much doubt and perplexity. For the rest, see the article **RESPIRATION**.

PHOSPHAT. PHOSPHITE. There are a variety of compounds of which phosphorus is the base, the nature of which should be therefore well understood, before the reader attempts to acquire any knowledge of the compounds which originate from it. Were we writing as monogrammists, we should, hence, certainly treat of phosphorus in the first place, and afterwards treat of its derivatives, among which range the two substances at the head of this article; but confined as we are to an alphabetical arrangement, we must, for the most part, discuss the different subjects which come before us in their alphabetical relation. We recommend to our readers, however, to peruse the article on **PHOSPHORUS**, before they run over the present, because they will have a much more accurate view of it than otherwise. We shall take leave, however, to connect the two substances, above stated, in a single article, because they have a strong natural connection, and will be far more easily comprehended by such an union.

The salts formed by the union of the phosphoric acid with different bases are called phosphats; those produced in like manner by the phosphorous

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acid are called phosphites. See the articles **PHOSPHORIC ACID** and **PHOSPHOROUS ACID**.

PHOSPHATES may be distinguished by the following properties: 1. When heated with combustibles, they are not decomposed, nor is phosphorus obtained. 2. Before the blowpipe they are converted into a globule of glass, which in some cases is transparent, in others opaque. 3. Soluble in nitric acid without effervescence, and precipitated from that solution by lime-water. 4. Decomposed, at least partially, by sulphuric acid; and their acid, which is separated, when mixed with charcoal and heated to redness, yields phosphorus. 5. After being strongly heated, they often phosphoresce.

The phosphates readily combine with an excess of acid, and form superphosphates.

The phosphates at present known amount to twelve, two of which are triple salts. Some of these salts occur in different states, constituting varieties.

1. *Phosphat of barytes*. It may be prepared either by saturating phosphoric acid with barytes or carbonate of barytes, or by mixing together an alkaline phosphat and nitrat or muriat of barytes. In either case, the phosphat of barytes precipitates immediately in the form of a white powder.

This salt is tasteless, incrustallizable by art, insoluble in water, and not altered by exposure to the air. Its specific gravity is 1.2867. When strongly heated, it melts into a grey coloured enamel. The proportion of its component parts is unknown.

This salt has not been applied to any use.

When phosphoric acid is dropt into a solution of barytes water, a precipitate of phosphat of barytes immediately falls. But this precipitate is redissolved by adding an excess of acid. Hence it follows, that this salt is capable of combining with an additional dose of acid, and forming a superphosphat of barytes.

2. *Phosphat of strontian*. Like the former, it may be formed by dissolving carbonate of strontian in phosphoric acid, or by mixing together nitrat of strontian and phosphat of soda. A white precipitate immediately falls, which is the phosphat of strontian.

This salt is tasteless, insoluble in water, and not alterable by exposure to the air. It is soluble in an excess of phosphoric acid; a property which distinguishes it from phosphat of barytes. Before the blowpipe it fuses into a white enamel, and at the same time emits a phosphoric light. It is completely decomposed by sulphuric acid, but by no other. According to Vauquelin, it is composed of

41.24 acid
58.76 strontian.

100.00

3. *Phosphat of lime*. Of this salt there are two varieties, the first neutral, the other a supersalt.

a. *Phosphat of lime, proper*. As this salt constitutes the basis of bones, it is not necessary to prepare it artificially. It may be obtained in a state of purity by the following process: Calcine the bones to whiteness, reduce them to powder, and wash them repeatedly with water, to separate several soluble salts which are present. Dissolve the whole in muriatic acid, and precipitate by means of ammonia. The precipitate, when well washed and dried, is pure phosphat of lime.

Phosphat of lime, thus prepared, is always in the state of a white powder; but it is found native in regular crystals. In that state it is known by the name of apatite. The primitive form of its crystals is, according to Hauy, the regular six-sided prism; and the primitive form of its intergranular particles is a three-sided prism, whose bases are equilateral triangles; but it very often assumes other forms. It is destitute of taste, insoluble in water, and not liable to be altered by exposure to the air. It may be exposed to a strong heat without undergoing any change; but in a very violent heat it becomes soft, and is converted into a white semitransparent enamel, or rather porcelain. According to the experiments of Saussure, a heat of 378 degrees Wedgwood is necessary to produce this effect.

Sulphuric, nitric, muriatic, fluoric, and several vegetable acids, are capable of decomposing phosphat of lime; but the decomposition is only partial. Fourcroy and Vauquelin have ascertained, that these acids are only capable of abstracting 0.40 parts of the lime, while the remainder continues combined with the phosphoric acid, constituting a superphosphat of lime. Hence the reason that phosphoric acid is capable also of decomposing partially the combinations of these acids with lime; it abstracts as much of the lime as is sufficient to convert it into superphosphat. Phosphat of lime, according to Fourcroy and Vauquelin, is composed of

41 acid
59 lime

100.

This salt is employed in making cupels; and almost solely in extracting phosphorus. It is also used, occasionally, as a medicine in rickets.

6. *Superphosphat of lime*. It is this salt which always remains in the aqueous solution when calcined bones are decomposed by means of sulphuric acid; and it may be formed artificially by dissolving phosphat of lime in phosphoric acid, till the acid refuses to take up any more, and afterwards evaporating the solution till the salt crystallizes. Its crystals are usually thin brilliant plates, resembling mother-of-pearl, which easily adhere together, and acquire a kind of gluey consistency. Its taste is strongly acid. Water dissolves it, and in a greater proportion when boiling hot than when cold. Hence a saturated solution of it in boiling water crystallizes on cooling. It attracts a little moisture when exposed to the air. When heated, it readily undergoes the watery fusion, then swells up and dries. In a high temperature it melts into a semitransparent glass, which is tasteless and insoluble, and is not altered by exposure to the air. When this salt is heated to redness along with charcoal, its excess of acid is decomposed, and converted into phosphorus, and phosphat of lime remains behind. It is from this salt that phosphorus is usually obtained; but the process of Fourcroy, which consists in decomposing the superphosphat of lime by means of acetat of lead, and afterwards decomposing the phosphat of lead by means of charcoal, must yield a much greater proportion of phosphorus.

No acid hitherto tried is capable of decomposing this salt, except the oxalic, which abstracts its base completely, and precipitates with it in the form of oxalat of lime; but it is decomposed and reduced to the state of phosphat of lime by all the

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alkaline and earthy bases. It is composed, according to the analysis of Fourcroy and Vauquelin, of

54 acid
46 lime

100.

4. *Phosphat of potass.* Of this salt there are two varieties; the first, which contains an excess of acid, and is in reality a superphosphat, has been long known, and appears to have been first mentioned by Lavoisier, in 1774; but it is to Vauquelin that we are indebted for an examination of its properties. The second, which is a neutral salt, was lately discovered by Darraeq. It had been formed, indeed, previously by Guyton Morveau and Desormes; but these gentlemen had mistaken it for phosphat of lime.

Superphosphat of potass is prepared by dropping carbonat of potass into phosphoric acid till all effervescence ceases, and then evaporating to the proper consistency. It does not crystallize. When evaporated sufficiently, it assumes the form of a jelly; and if the evaporation is carried farther, it becomes dry altogether. Its specific gravity, when dry, is 2.85. It is exceedingly soluble in water, and when dry readily attracts moisture from the atmosphere, and is converted into a viscid liquid. When heated, it first undergoes the watery fusion; then allows its water of crystallization to evaporate, and is reduced to dryness. In a high temperature it melts into a transparent glass, which deliquesces again when exposed to the air.

It is completely decomposed by the sulphuric, nitric, and muriatic acids; and by barytes, strontian, and lime.

6. *Phosphat of potass, proper.* This salt may be formed by mixing together superphosphat of potass and pure potass, and exposing them to a strong heat in a platinum crucible. A white coloured substance is obtained, which is the phosphat in question. This salt is tasteless, and insoluble in cold water, but soluble in hot water, and it precipitates as the solution cools in a gritty brilliant powder. It is extremely fusible; melting before the blowpipe into a transparent bead, which becomes opaque on cooling. It is soluble in nitric, muriatic, and phosphoric acids; the solutions are thick, glutinous, and adhesive. When sufficiently diluted, the alkalies occasion no precipitate in these solutions; but when they are concentrated, a precipitate appears.

5. *Phosphat of soda.* This salt exists ready formed in urine, and was the first known of all the phosphats. It occupied a good deal of the attention of chemists; and the difficulty of analysing it gave occasion to various hypotheses concerning its nature. Hellot remarked it in urine; and described it in 1737, as a salt different from those that had usually been observed. Haupt described it in 1740 under the name of *sal mirabile perlatum*, or "wonderful perlated salt." It was called perlated from the grey, opaque, pearl-like colour which it assumed when melted by the blowpipe. Margraff examined it in 1745, and found it would not yield phosphorus when treated with charcoal, as the other salts of urine did.

Dr. Pearson afterwards introduced it with great advantage into medicine as a purgative. He gives the following process for preparing it: Dissolve, in a long-necked matrass, 1400 grains of crystal-

lized carbonat of soda, in 2100 grains of water, at the temperature of 150 degrees. Add gradually 500 grains of phosphoric acid of the specific gravity 1.85. Boil the liquor for some minutes, and while it is boiling hot, filtrate it, and pour it into a shallow vessel. Let it remain in a cool place, and crystals will continue to form for several days. From the above quantities of materials he has obtained from 1450 to 1550 grains of crystal.

Its crystals are rhomboidal prisms, of which the acute angles are 60 degrees, and the obtuse angles 120 degrees, terminated by a three-sided pyramid. Its specific gravity is 1.333. Its taste is almost the same with that of common salt. It is soluble at the temperature of 60 degrees in about four parts of water, and in two parts of boiling water. This solution crystallizes on cooling; but in order to obtain the salt properly crystallized, the solution should contain a slight excess of alkali. When exposed to the air, this salt very soon effloresces on the surface. When heated, it undergoes the watery fusion. At a red heat it melts into a white enamel. Before the blowpipe it melts into a transparent globule, which becomes opaque on cooling, and its surface acquires a polyhedral figure. It is not altered by combustibles nor metals. With metallic oxyds it enters into fusion, and forms a coloured globule of glass. Sulphuric, nitric, and muriatic acids decompose it partially, and convert it into superphosphat of soda. In this state it is more soluble in water, and not so easily crystallized; but may be obtained, by proper evaporation, in a state of thin scales, not unlike boracic acid.

The greater number of earths may be fused along with this salt, and converted into glass.

This salt has been applied to various uses. It has been introduced into medicine as a purgative, and on account of its pleasant taste has of late been much used. It is usually taken in broth, which it is employed to season instead of common salt. It may be substituted for borax, to promote the soldering of metals. Mineralogists employ it very much as a flux, when they examine the action of heat on minerals by means of the blowpipe.

6. *Phosphat of ammonia.* This exists also in urine, and seems to have been first accurately distinguished by Rouelle. It is usually prepared by saturating with ammonia the superphosphat of lime obtained from bones, and evaporating the solution to such a consistency, that when allowed to cool, the phosphat of ammonia is obtained in crystals.

It crystallizes in four-sided prisms, terminated by equal-sided pyramids. Its taste is cooling, salt, and ammoniacal. Its specific gravity is 1.80. It is soluble in four parts of water at the temperature of 60 degrees, and in rather a smaller proportion of boiling water. It is by spontaneous evaporation that it is obtained in the state of regular crystals. It is not altered by exposure to the air. When heated, it undergoes watery fusion; it then dries, but if the heat is continued, it swells up, loses its alkaline base, and the acid melts into a transparent glass. It is the only one of the earthy and alkaline phosphats which can be decomposed by heat. Hence the reason that it yields phosphorus when distilled along with charcoal.

It is decomposed by the sulphuric, nitric, and muriatic acids, and by the fixed alkalies and alka-

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fine earths. It is capable of combining with an additional dose of acid, and of passing into the state of a superphosphat.

This salt is much employed as a flux in experiments with the blowpipe. It enters also as an ingredient in those coloured glasses called pastes, which are made in imitation of precious stones.

7. *Phosphat of magnesia.* It is usually prepared by dissolving carbonat of magnesia in phosphoric acid, and evaporating the solution gradually till the salt crystallizes; but it may be obtained in large regular crystals by a much easier process. Mix together equal parts of the aqueous solutions of phosphat of soda and sulphat of magnesia. No apparent change takes place at first; but in a few hours large transparent crystals of phosphat of magnesia make their appearance in the solution.

Its crystals are six-sided prisms, the sides of which are unequal. It has very little taste; however, it leaves a cooling and sweetish impression upon the tongue. Its specific gravity is 1.55. It requires about 15 parts of cold water to dissolve it. It is more soluble in boiling water, but it crystallizes in part as the solution cools. When exposed to the air, it loses its water of crystallization, and falls down in powder. When heated moderately, it is also reduced to a dry powder. In a high temperature it melts into a transparent glass.

8. *Phosphat of glucina.* It is obtained by pouring phosphat of soda into the solution of glucina in sulphuric, nitric, or muriatic acids. The phosphat of glucina is precipitated in the state of a white powder. It does not crystallize. It is tasteless, insoluble in water, unless it contains an excess of acid, and not liable to be altered by exposure to the air. When heated strongly, it melts into a transparent glass.

9. *Phosphat of yttria.* When the solution of phosphat of soda is mixed with the sulphat, nitrat, or muriat of yttria, phosphat of yttria precipitates in gelatinous flakes.

10. *Phosphat of alumina.* It may be formed by saturating phosphoric acid with alumina. It is a tasteless powder, insoluble in water. Dissolved in phosphoric acid, it yields a gritty powder, and a gummy solution, which by heat is converted into a transparent glass.

11. *Phosphat of soda and ammonia,* known to chemists by the names of microcosmic salt, and fusible salt of urine, was extracted from urine, and examined much sooner than any of the other phosphats: it was long before philosophers were able to form precise notions concerning its nature, or even to obtain it in a state of purity. This, indeed, could not be expected till the phosphats of soda and of ammonia had been accurately examined, and their composition ascertained. Fourcroy was the first who gave a precise account of the proportion of its component parts. According to him, it is composed of

32 acid
24 soda
19 ammonia
25 water

100.

The properties of this salt are nearly those of the phosphat of soda and phosphat of ammonia joined together. It answers better than the first of them as a flux; because the heat soon drives off the ammonia, and leaves an excess of acid. Its specific gravity is 1.5. When exposed to the air, this salt effloresces, and gradually loses its ammonia.

12. *Phosphat of ammonia and magnesia* was first discovered by Fourcroy, who found it in a calcareous concretion, formed in the colon of a horse. Since this discovery, Fourcroy and Vauquelin have observed it also in human urine.

It might be prepared by mixing together solutions of the phosphats of ammonia and of magnesia in water; the triple salt immediately precipitates in the state of a white powder. When urine is allowed to remain a considerable time in close vessels, it often deposits this salt in regular crystals on the sides and bottom of the vessel. These crystals are small four-sided prisms, terminated by irregular four-sided pyramids. This salt is tasteless, scarcely soluble in water, and not liable to be altered by exposure to the air. When heated it falls to powder, gives out its ammonia, and in a high temperature melts into a transparent globule. It is composed of

33 phosphat of ammonia
33 phosphat of magnesia
33 water

99.

Phosphoric acid and silica, when mixed together and exposed to a strong heat, melt into a beautiful transparent glass, which is not decomposed either by the action of acids or of alkalies. Fourcroy has given this compound the name of phosphat of silica; but it is essentially different from salts, and ought, therefore, rather to be ranked among some other class of bodies.

PHOSPHITES, or those salts that are formed with the phosphorous acid united to the earths, alkalies, and metallic oxyds, may be distinguished by the following properties: 1. When heated they emit a phosphorescent flame. 2. When distilled in a strong heat, they give out a little phosphorus, and are converted into phosphats. 3. They detonate when heated with nitrat or oxy muriat of potass, and are converted into phosphats. 4. They may be converted into phosphats by nitric and oxy muriatic acid. 5. They are fusible in a violent heat into glass.

The phosphites at present known amount to eight:

1. *Phosphite of lime.* This salt may be formed by dissolving lime in phosphorous acid. When the saturation is complete, the salt precipitates in the state of a white powder. It is tasteless and insoluble in water; but it dissolves in an excess of acid, and forms a superphosphite. This last salt may be obtained in prismatic crystals, by evaporating the solution. It is not altered by exposure to the air. When heated, it phosphoreces and emits a little phosphorus. In a violent heat, it melts into a transparent globule.

It is composed of 34 acid
51 lime
15 water

100.

2. *Phosphite of barytes* may be formed by pouring phosphorous acid into barytes water, or this last water into a solution of phosphite of soda. In either case, phosphite of barytes precipitates in the form of a white powder. It is tasteless, and but very sparingly soluble in water, unless there is an excess of acid. It is not altered by exposure to the air. Before the blowpipe it melts, and is surrounded with a light so brilliant, that the eye can scarcely bear it. The globule which it forms becomes opaque as it cools.

P H O

It is composed of 41.7 acid
51.3 barytes
7.0 water

100.0.

3. *Phosphite of magnesia* is best formed by mixing together aqueous solutions of phosphite of potass or soda and sulphat of magnesia; the phosphite of magnesia gradually precipitates in beautiful white flakes. It has no sensible taste. It is soluble in 400 parts of water at the temperature of 60 degrees, and scarcely more soluble in boiling water. When its solution is evaporated slowly, a transparent pellicle forms on its surface, flakes are deposited, and towards the end of the process, small tetrahedral crystals are precipitated. When exposed to the air, it effloresces. When heated, it phosphoresces and melts into a glass, which becomes opaque on cooling.

It is composed of 44 acid
20 magnesia
36 water

100.

4. *Phosphite of potass.* This salt is formed by dissolving carbonat of potass in phosphorous acid, and evaporating the solution slowly till it deposits crystals of phosphite of potass. It crystallizes in four-sided rectangular prisms, terminated by dihedral summits. Its taste is sharp and saline. It is soluble in three parts of cold water, and still more soluble in boiling water. It is not altered by exposure to the air. When heated, it decrepitates, and then melts into a transparent globule, which becomes opaque on cooling. It does not phosphoresce so evidently as the other phosphites, perhaps because it contains an excess of potass, which saturates the phosphoric acid as it forms.

It is composed of 39.5 acid
49.5 potass
11.0 water

100.0.

5. *Phosphat of soda* may be prepared exactly in the same way as phosphite of potass. Its crystals are irregular four-sided prisms, or elongated rhomboids. Sometimes it assumes the form of square plates, or of plumose crystals. Its taste is cooling and agreeable. It is soluble in two parts of cold water, and scarcely more soluble in boiling water. When exposed to the air it effloresces. Before the blowpipe, it emits a beautiful yellow flame, and melts into a globule, which becomes opaque on cooling.

It is composed of 16.3 acid
23.7 soda
60.0 water

100.0.

6. *Phosphite of ammonia* may be prepared by the same process as the two last described phosphites. It crystallizes sometimes in long transparent needles, and sometimes in four-sided prisms terminated by four-sided pyramids. It has a very sharp saline taste. It is soluble in two parts of water, at the temperature of 60 degrees, and still more soluble in boiling water. When exposed to the air, it attracts moisture, and becomes slightly deliquescent. When distilled in a retort, the ammonia is disengaged partly liquid and partly in the state of gas, holding phosphorus in solution,

P H O

which becomes luminous when mixed with oxygen gas. Before the blowpipe on charcoal, it boils, and loses its water of crystallization; it becomes surrounded with a phosphorescent light; and bubbles of phosphureted hydrogen gas are emitted, which burn in the air with a lively flame, and form a fine coronet of phosphoric acid vapour. This gas is emitted also when the salt is heated in a small glass bulb, the tube belonging to which is plunged under mercury.

This salt is composed of 26 acid
51 ammonia
23 water

100.

7. *Phosphat of ammonia and magnesia.* This salt may be formed by mixing together the aqueous solutions of its two component parts. It is sparingly soluble in water, and may be obtained in crystals; but its properties have not been examined with precision.

8. *Phosphite of alumina* may be prepared by saturating phosphorous acid with alumina, and then evaporating the solution to a proper consistence. It does not crystallize, but forms a glutinous mass, which dries gradually, and does not afterwards attract moisture from the air. Its taste is astringent. It is very soluble in water. When heated it froths, and gives out phosphorus, but it does not readily melt into a globule of glass.

Hitherto none of these salts have been applied to any useful purpose. It hence appears, therefore, that phosphites are salts formed by the combination of the phosphorous acid with different bases.

PHOSPHORESCENCE. Light thrown forth from substances that at the same time emit little or no heat at the common temperature of the atmosphere, and which are denominated phosphoric.

The phosphorus properly so called, and which is usually understood in chemical books, and employed in chemical processes, is that commonly known by the name of Kunckel's phosphorus, and which we shall describe under that designation. But there are various other substances that possess, in different degrees, the same kind of illuminating power, and which it is hence necessary to take some notice of, as well as of the effects they produce.

Of these kinds of phosphorescent substances there are three leading divisions. The first comprehends those which require a previous exposure to the solar or other light, in order to become luminous; whence they are called solar phosphori: the second includes those which, without any necessary previous exposure to light, become luminous when moderately heated, which are denominated calorized phosphori; or phosphori from heat: the third comprehends those substances belonging to the animal and vegetable kingdoms, which emit light spontaneously at the common temperature, without the necessity of a previous exposure to light, and these are called spontaneous phosphori.

Solar phosphori.

A casual discovery by Vincenzio Cascariolo, a shoemaker of Bologna, about 1630, was the first circumstance that attracted the notice of philosophers to this curious subject. This man being in quest of some alchemical secret was induced to calcine a parcel of Bolognian spar (a subspecies of

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heavy spar or native sulphat of baryte), which he had procured from Monte Paterno, in the neighbourhood of the city; and observed, that whenever this substance, thus prepared, was placed in a dark room, after having been exposed to the sun, it continued to emit faint rays of light for some hours afterwards.

In consequence of this interesting discovery, the Bolognian spar came into considerable demand among natural philosophers, and the curious in general, so that the best way of preparing it was found an object of some pecuniary importance. This seems to have been hit upon by the family of Zagoni, who supplied all Europe with Bolognian phosphorus, till the discovery of more powerful phosphoric put an end to their monopoly. Margraaf, some years afterwards, proved that other species of sulphated baryte might, under particular management, be made to produce a similar effect.

In the year 1677, nearly half a century after the discovery of the Bolognian phosphorus, G. A. Baldwin, a native of Misnia, observed that if nitrat of lime were evaporated to dryness, and then formed into a compact mass by fusion at a red heat, it would exhibit the same property of imbibing and emitting light as the former, only somewhat inferior in degree: hence this preparation obtained the name of Baldwin's phosphorus.

In 1730, M. du Fay, who is justly celebrated for his electrical researches, directed his attention to this subject, and observed, that all earthy substances susceptible of calcination, either by mere fire, or when assisted by the previous action of nitrous acid, possessed the property of becoming more or less luminous when calcined and exposed for a short time to the light: that the most perfect of these phosphori were limestones, and other kinds of carbonated lime, gypsum, and particularly the topaz; and that some diamonds were also observed to be luminous by simple exposure to the sun's rays, without being previously ignited; while flint, sand, jasper, agate, and rock crystal, were inphosphorescent.

Not long after, M. Beccaria discovered that a great variety of other bodies were convertible into phosphori, by exposure to the mere light of the sun; not only the varieties of carburet and sulphat of lime, but organic animal remains, and geodes lined with minute crystals of quartz; most compound salts, when clear and crystallized, particularly Glauber's, nitre, and borax, were also found to be phosphorescent: of vegetable substances all the farinaceous and oily seeds, all the gums and several of the resins, the white woods, and vegetable fibre, either in the form of paper or linen; also starch and loaf-sugar proved to be good phosphori, after being made thoroughly dry, and exposed to the direct rays of the sun. Sundry animal matters, by a similar treatment, were also converted into good phosphori, particularly bone, either fresh or calcined, sinew, glue, hair, horn, hoof, feathers, and fish shells. The same property, he observed, might be communicated to rock-crystal, and some of the gems, by rubbing them against each other, so as to roughen their surface, and then placing them for some minutes in the focus of a lens, by which the rays of light were concentrated upon them at the same time that they were also moderately heated.

In the year 1763, Mr. Canton contributed some important facts relative to solar phosphori, and communicated a method of preparing a very power-

ful one, which, after the inventor, is usually called Canton's phosphorus. It is thus made: calcine oyster-shells in the open fire for half an hour; then select the whitest and largest pieces, and mix them with flowers of sulphur in the proportion of one part of the latter to three parts of the former; pack the whole closely into a crucible; lute on a cover, and heat it pretty strongly for one hour; when the crucible has again become quite cold, turn out its contents, and select the whitest pieces for use. Mr. Canton affirms, that his phosphorus, inclosed in a glass flask, and hermetically sealed, retains its property of becoming luminous for at least four years, without any apparent decrease of activity.

Mr. Wilson found that a much greater brilliancy of colour would be produced by letting the oyster-shells come in direct contact with the burning coals, or other inflammable matter, and by being covered with it; and that if the covering matter be iron, the luminousness will be very bright; if steel, still brighter and more iridescent; but if plates of charcoal, most so of all.

If a common box smoothing iron, heated in the usual manner, be placed for half a minute on a sheet of dry, white paper, and the paper be then exposed to the light, and afterwards examined in a dark closet, it will be found that the whole paper will be luminous, that part however on which the iron had stood being much more shining than the rest.

Colorized phosphori.

Besides those substances that are phosphorescent by exposure to the rays of the sun, there are others which give out light when simply heated. These materially differ from the former in this circumstance, that after having been continued at any particular temperature till their luminousness is exhausted, they are incapable of becoming again luminous, except at a greater heat than that to which they were first subjected. The range of temperature at which these bodies become luminous is not very extensive, commencing at about 400° Fahr. and terminating at the lowest visible red heat. The following is a list of substances exhibiting this, properly arranged by Mr. S. Wedgwood, according to the brilliancy of the light.

That variety of the blue fluor spar of Derbyshire, which, when scraped or struck, emits a fetid, bituminous odour, is the most phosphorescent by heat of all the known substances: it glows, when moderately heated with a pale emerald green light, sufficiently intense to be very visible even in daylight. To the second rank belong the common swine-stone, the common blue fluor, and red felspar, all which, as well as the following, exhibit a white or reddish light. The third class includes the diamond, the ruby, carbonated baryte, chalk, colourless calcareous spar, sea-shells, granite, and white fluor. The fourth class comprehends white sand, carbonated magnesia, heavy spar, flint, white marble, quartz, porcelain, and earthenware. The fifth class includes most of the metals, sulphat of potash, borax, white paper, white linen, sawdust, and asbestos. Under the sixth and last class are comprehended oil, wax, spermaceti, and butter when boiling or nearly so. Most of these are also phosphorescent by friction.

Spontaneous phosphori.

There are many animals, and especially belonging to the insect and worm classes, that give forth a considerable quantity of light in the dark, while

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alive and in health. Such are the common glow-worm, the fire-flies of America and of Italy, the fulgora of China, and the elater among the former, to which also we may add the cancer fulgens, a species of crab; and such, among the latter, are a few shell-fishes, some of the marine molluscs, the pyrosoma, the phloas, and various others, which will be found enumerated in the article LUMINOUS ANIMALS: many of which appear to have a power of secreting this phosphorescence at their will.

But besides these, there are various animals, and animal substances, and some vegetable substances, that emit light after death, without any aid derived from exposure to solar light, heat, or combustion of any kind. Generally speaking, this phosphorescence in animals makes its appearance before the commencement of putrefaction, and ceases when the latter is completely established. These animal substances are chiefly the flesh of the carp and various other water-fishes, of the tadpole, but not of the frog; but especially the flesh of salt-water fishes, which is peculiarly rich in phosphorescent matter. Of vegetable matters that become luminous, the principal is decayed wood: peat also, though very rarely, has exhibited a similar appearance. The chief observers who have turned their attention to this subject are Mr. Boyle, Mr. Canton, and Dr. Hulme.

The only laboratory required for these processes is a dark room, and the only preparation of the fish is that he should be gutted and split, and his scales taken off. The herring seems to afford more light than any other fish. The time which sea-fishes, as fresh as they can commonly be procured in a market, take to become luminous is about twelve hours: the phosphorescence is faint and partial at first, but soon spreads over the whole surface, and becomes very bright before putrefaction ensues; after which it gradually becomes more faint, but does not entirely disappear in less than four or five days: the luminous matter may be scraped off with a blunt knife, and will continue to shine for a considerable time. The production of this phosphoric light does not afford any heat ascertainable by the thermometer. By exposure to a freezing temperature, the light is rendered latent, and is wholly destroyed when plunged into boiling water; yet warmth to a certain extent obviously increases its brilliancy. It cannot be produced except by the contact of atmospheric air; yet when once excited, it is not increased by being placed in oxygen gas, or impaired by azot.

This light has by some philosophers been conceived to be derived from the sun; and by others to be a substance of a peculiar kind. To this last opinion M. Dessaignes is strongly inclined, who has lately presented a very long and elaborate memoir upon the subject to the French national institute, and in which he has endeavoured to examine minutely into its mode of action. His memoir, which is divided into five parts, has excited much attention on the continent, and as such we are compelled to notice it. The author first defines phosphorescence to be "an appearance of light, durable or fugitive, not sensibly containing any heat, and without any subsequent alteration in inorganic bodies." He distinguishes four kinds of phosphorescence, viz. phosphorescence by the temperature being raised, that which bodies exhibit when exposed to the light or to electrical discharges, that which arises from percussion, from pressure, or from friction, and last of all, spontaneous phosphorescence.

The author recognised the first of these various modes of phosphorescence in almost all bodies presented to us by nature, with but very few exceptions. For this purpose he placed them on a metallic stalk in a dull heat, in order that the lustre of a red-hot support might not hinder him from observing the phosphoric light in bodies in which it shines but feebly. He made his experiments on bodies which light renders phosphorescent in a dark room, furnished at the side exposed to the sun with a small trap-door, which opened and shut at pleasure. Exposure to the rays of the sun for a few seconds is sufficient for exhibiting the shining of these bodies, the instant we intercept them, with all the brilliancy of which they are susceptible. The light which they give out in this case is, in general, in an inverse ratio to their degree of humidity: but they do not lose entirely this kind of phosphorescence, except when they are mixed with a quantity of water sufficient for holding them in solution, or when they themselves pass to the liquid state. The third kind of phosphorescence, which may be, generally speaking, called phosphorescence by collision, supposes a texture of a gravelly rather than of a glassy nature, and we do not obtain it at its highest degree, except by the contact of a body of one and the same species, or of a still harder body. It also supposes the hardness of the constituent molecules, but it is not necessary that they should be strongly united together: thus, sugar, in which the molecules feebly adhere, is, as we know, very phosphorescent upon collision.

Spontaneous phosphorescence is presented during certain combinations, wherein the molecular action is energetic, like that which combines lime and water, the phosphorescence lasts but a few seconds, and the slower the combination takes place, it is the more permanent: this happened in the case of all the woods which the author submitted to experiment, whether they were growing or cut down. They become equally shining in both cases when they are penetrated with humidity, in contact with the atmospheric air, and at a temperature of 8 or 10° of the centigrade thermometer.

The principal facts ascertained by M. Dessaignes, relative to these four kinds of phosphorescence, are as follows. So far from the phosphoric light being regarded as a consequence of the incandescence of the supporter, it disappears completely in the case of various bodies, which shine very well on a support heated merely to 200°. Bodies which are phosphorescent at an elevation of temperature are equally so on metallic supporters, on those which are bad conductors of caloric, like glass or porcelain, and in boiling mercury or even in water, when substances are acted upon which require a temperature of 100° only to shine. The fluat of lime, the phosphat of lime of Estremadura, and the adular stone in powder, shine at 100° or 112° of the centigrade thermometer: glass, sand, porcelain, and in general all the vitreous stones, do not shine completely except at 375°. All bodies which are phosphorescent at an elevated temperature require middle degrees of heat between these two extremes: the whole shine more or less at 256°, a temperature determined by the fusion of bismuth.

Many of the experiments seem to prove that the light which escapes is in a direct ratio with the degree of temperature, and its duration in an inverse ratio. A substance which, like fluat of lime, shines well at a low temperature, ceases to possess

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this property if it have previously undergone a stronger heat: but it preserves that of becoming luminous on a body still hotter. The same substance subjected several times successively to a temperature of 300° gave a fine light, which lasted at the first projection $30''$, at the second $15''$, and at the third $10''$. Fifteen other successive projections gave a light of the same duration and intensity as the fourth. Vitreous bodies lose their phosphoric properties with great difficulty: for this purpose they must be calcined strongly for half an hour, or even an hour, while all the metallic bodies, their phosphorescent oxyds, and all the metallic salts, lose it on the first projection in an iron spoon slightly heated. Lime, barytes, strontian, magnesia, alumine, and silex, cannot lose their phosphoric property, whatever may be the degree of heat to which they are subjected. These earths heated at first to 100° or 125° , do not omit any light on a support heated to 250° , whereas they shine well if thrown upon it cold. The carbonats of lime, barytes, and strontian, lose their phosphorescence upon a moderate calcination, and resume it afterwards if we calcine them to whiteness for half an hour, which seems to arise from their then passing partly to the state of caustic alkaline earths. All the earthy or alkaline salts lose their phosphorescence upon calcination: those which are soluble resume it in proportion to their solubility, when they remain exposed to the air, particularly if humid. The insoluble salts, in the same way as quartz, adular, glass, &c. lose it entirely. The vegetable and animal substances lose it in the same way, but only when reduced to the state of charcoal.

M. Dessaignes has ascertained, that the most phosphorescent bodies are those, in the composition of which some of their elements have passed from the gaseous or liquid to the solid state. He remarks that the light of phosphorescence is, like every other, decomposable by the help of a prism into rays of various colours. It is of itself coloured generally in blue in all the phosphorescent bodies which do not contain metallic oxyds, and becomes so in bodies which contain them; like the powder of calcined bones, the light of which is yellow, the phosphat of lime of Estremadura, and the green fluat of lime, which present a green light, when we free them from the oxyds which they contain, by dissolving them in the muriatic acid, and precipitating them with ammonia.

The phosphorescence of mineral substances undergoes no variation on inserting them into the various gasses, which proves that it is not the result of a combustion. That of vegetable and animal matters becomes brisker, on the contrary, in oxygen, and disappears in azote, hydrogen, and carbonic acid: nevertheless, linsed oil obtained by pressure, and heated in a vacuum or carbonic acid, at 125° , becomes sensibly luminous; but when this light has disappeared, it remains constantly obscure while it is in the same circumstances. When heated in the open air nearly to ebullition, it burns with a shining light, of a quite different nature, since it is extinguished in the carbonic acid, and is revived in the atmospheric air. The first of these phosphorescences is analogous to that of mineral substances, the second is a true combustion. All the metallic oxyds made by calcination are inphosphorescent, at least if they have not passed to the state of semi-vitrification. Those which we obtain by the humid way lose their phosphorescence by drying them on a filter above burning coals. The phosphat of mercury

resists a little longer; but when the filtering paper begins to turn red, there arises a mass of light, after which it remains dark like the rest. All bodies which have too great a quantity of water in their composition are inphosphorescent. Slaked lime is very luminous in dry, and very dull in damp weather. The concrete carbonat of lime only gives a few sparks, that of primitive formation is very phosphorescent at an elevated temperature. All substances which are melted or softened on the heated supporter remain obscure. Many mixed substances which do not soften at 256° , and which shine very well at this degree of heat, become obscure as soon as the temperature is high enough for the particles to be disunited. The facility with which the acidulated salts, with the exception of the borates, enter into fusion, renders them inphosphorescent. The acid tartrite of potash shines, however, but only by the combustion of its vegetable principles. The volatile salts manifest the same inphosphorescence. Lastly, those which contain a great quantity of metallic oxyds not dissolved, but mixed with their substance, do not exhibit any phosphorescence. In general, the substances which attract humidity very strongly do not shine except when they are united to a less quantity of water than that which could saturate them, or, as is commonly said, slake them completely; but it is not requisite that they should be totally deprived of it. The author particularly observed the influence of this circumstance on the phosphorescence produced by the alkaline earths in contact with concentrated sulphuric acid. Small pieces of caustic barytes, as dry as it was possible to procure them, emit no light when thrown into this acid, and are not at first dissolved in it. When moistened by the breath simply, they give out light at the moment of touching the acid, and are converted into sulphate of barytes. When too much moistened, they again become dull. Lime and strontian exhibit the same phenomena. According to this remark as to the quantity of water necessary to phosphorescence, M. Dessaignes made sulphats and muriats of soda and of potash and fluat of lime, deprived of all phosphorescence, because they contained no water, by using alcoholic solutions, instead of aqueous solutions, in the ordinary operations of precipitations or double decompositions which give birth to these salts. It is to be remarked, that the salts which have lost by calcination their phosphorescence, with the water which they contained, take up part of it again, after having undergone igneous fusion. It is the same with glass and metallic scales become dull by calcination, which shine once more on the warm supporter after having been fused.

The examination afterwards entered into of the relations between electricity and phosphorescence, by elevation of temperature, presents facts of great interest. Among the metallic powders, those of zinc and antimony are the most phosphorescent, and those of gold and silver are least so. All of them, when prepared in damp weather, with all the precautions most proper for making them shine, are inphosphorescent, as well as the metallic oxyds. In dry weather the contrary is the case. Antimony, even in very dry weather, loses its phosphorescence, if it be pounded and strongly rubbed against a metallic mortar. In an insulated vessel, it acquires a high degree of phosphorescent properties. Glass pounded in dry weather is more luminous than when the operation has been performed in a damp atmosphere. It loses almost all its phosphorescence when pounded in wet linen;

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but it does not lose it, like antimony, when the operation is performed in a metallic mortar, because there is no transmission of the electrical fluid. It is not the case with adular spar, the powder of which does not retain a fine phosphorescence, unless it has been prepared in an insulating mortar. In all cases where a vessel of this nature has been employed, the author took care to use one with an insulating pestle. In the last place, glass rendered dull by calcination resumes all its phosphorescence when exposed on an insulating supporter between the two balls of an electrical excitator, after it has received four or five electrical discharges. This method equally succeeds with every substance which has lost its phosphorescence by calcination. There is not even a necessity for a discharge, and we restore phosphorency to calcined adular, for example, by a simple current of electricity, determined by a conductor terminated in a point, and which is passed through this substance reduced to a liquid paste, with a quantity of water sufficient for leaving an easy passage to the electric fluid. After three or four minutes of electrization, this paste, afterwards dried spontaneously, yielded a very phosphorescent powder on the hot supporter. What is most remarkable in this way of restoring phosphorescence to bodies which have lost it by calcination, is, that it never re-establishes it in those which have been deprived of it by exposure to the light of the sun.

M. Dessaignes next makes inquiries as to the phosphorescence produced by light or by electricity. He first refutes the opinion of a great number of persons, as to the cause of the lustre which is preserved during a longer or shorter period by bodies exposed to the light of the sun. The sulphuret of lime, known by the name of Canton's phosphorus, the dried nitrat of lime, glucine, and Bolognian phosphorus, after having been hit by red rays only, shone with precisely the same yellow, white, green, and reddish colours, which they afforded when exposed to the ordinary light of the sun. The same thing took place after their exposure to the light of each ray of the solar spectrum, or to that of coloured flames; and what confirms the idea that these phenomena are not owing, as has been supposed, to the imbibition of light by the phosphorescent substance, is, that Canton's phosphorus, prepared without having experienced in any shape the contact of light, shines equally upon a heated supporter, or even by the simple heat of the hand. This phosphorus shines, on exposure to the light of the moon or to that of a lamp. The light of the moon is not sufficient for Bolognian phosphorus, which takes fire, however, on being exposed to the light of a lamp with a stream of air. Most of the other phosphorescent substances require the light of the sun. It is sufficient, even after having been reflected, for several salts: but cat's eye, hyoline quartz, and phosphat of Estremadura lime, do not shine until after having been exposed to the direct light. Other substances, such as zircon, ruby, cymophane, and other vitreous stones, absolutely resist the action of the light, even when it is concentrated in the focus of a burning mirror.

The general result of the experiments made upon a very great number of bodies exposed to the light of the sun, seems to determine that those which are demi-conductors of the electric fluid are all susceptible of taking fire by these means; that isolating bodies do not shine equally, some of them doing so feebly, or with difficulty, and the rest not at all. Lastly, that bodies which are conductors

remain dull; and this happens to the metals, to charcoal, to carburet of iron, to all the sulphurets and metallic oxyds, with the exception of orpiment, the semi vitreous oxyds of arsenic and tin, and those of zinc and lead made in the humid way. Among the metallic salts, the author has only found that the muriate of tin, the sulphat and the phosphat of lead, shine after being exposed to the sun.

A remarkable difference between the inphosphorescence which insulating bodies and good conductors present, either in the light, or when subjected to feeble electrical discharges, while all the demi-conductors shine by these two methods, consists in the faculty which the former have of becoming luminous after very strong discharges; the latter remain constantly dull, however strong the explosions may be.

When bodies have been calcined until they have become inphosphorescent, either upon a heated supporter, by exposure to the light, or by a first electrical shock, the two first methods cannot restore their phosphorescence; but they resume it by reiterated discharges, and then they again become equally sensible as formerly to heat, light, and a single electrical discharge.

Various experiments seem to prove, that these three modes of phosphorescence increase or diminish by the same circumstances. Thus, the sulphat of soda, subjected to the action of light and to that of electricity in four different states, crystallized, deprived of half its water of crystallization, of three-fourths of it, and entirely calcined, burnt for the same length of time, whether the phosphorescence was excited by the shock of the light, or by that of electricity: viz. in the first instance during 6", in the second 8", in the third 200", in the last 4" only, and with a very feeble light. Sulphat of potash rendered inphosphorescent by calcination, thus deprived of its water of crystallization, and immediately inclosed in a tube furnished with excitators, resumed, after five or six electrical discharges, the property of shining by isolation, as it did before being calcined: hence we may conclude, that the complete desiccation of phosphorescent substances does not deprive them of this property, except by rendering them less susceptible of permitting the passage of the electric fluid, and not because a small quantity of water is indispensable for the production of this phenomenon.

In phosphorescence excited by collision all bodies susceptible of shining are, with very few exceptions, luminous on the heated supporter, by exposure to light and by electrization. This property also diminishes in proportion as bodies are more or less completely calcined: nevertheless glass, calcined until it has become inphosphorescent by every other method, also emits a brisk light under the action of the file; but in order to produce this effect, the friction must be much stronger than before calcination. This kind of phosphorescence, which takes place like the foregoing in vacuo, and in the irrespirable gasses, seems besides, from the whole phenomena, to be produced by the same cause. This is attributed to the oscillations of a particular fluid, which heat, light, electricity, and a blow or friction put in motion; while calcination, or a long exposure to the light, drives it from bodies which are exposed to it: but we do not find, on this hypothesis, how strong electrical discharges reproduce the phosphorescence, unless this fluid and the electrical fluid are one and the same. The author thinks this opinion ought to be rejected,

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because we perceive no sign of electrical attraction, or repulsion, in bodies which have recovered in this way the phosphorescence which they had lost, and because it is excited by an electrical discharge in various bodies plunged under water. But if we recollect that water is a very bad conductor of the electrical fluid, and that we are but imperfectly acquainted with the various modifications of which this fluid is susceptible, and the cause of the brilliant light which it gives in vacuo, we may naturally look for new facts, before we decide that the fluid of phosphorescence is essentially different from that to which we ascribe the phenomena of electricity.

In examining the spontaneous phosphorescence of animal and vegetable substances, the author concludes from his experiments, that it is owing to a true combustion, in which water and carbonic acid are formed; as we easily ascertain the presence of this acid in the residuum by means of lime-water. Wood loses more than half its weight before ceasing to shine. This phosphorescence is not extinguished until after some time in the irrespirable gasses, but this is on account of the air contained in the pores of the phosphorescent substance, and the presence of which is easily ascertained by putting this substance in water under the receiver of the pneumatic machine. In proportion as the air escapes, the phosphorescence diminishes, and soon disappears entirely. M. Dessaignes ascertained that this air, already vitiated, only contains about three-fifths of the oxygen of an equal volume of atmospheric air.

This kind of phosphorescence is destroyed without remedy, by immersion in boiling water: it is suspended in water at 50° , and at the freezing temperature: it subsists from 6° to 37° .

The author having put a piece of phosphorescent fish in a saline solution, favourable to phosphorescence, but which had been previously deprived of air by ebullition, found it completely dull after leaving it for two hours. Upon introducing a bubble of air into the phial, phosphorescence for a few minutes was restored; new bubbles of air produced the same effects; but afterwards the phosphorescence became constant as in the atmospheric air, apparently because the water took up that of which it had been deprived by ebullition.

PHOSPHOROUS ACID. See PHOSPHORIC ACID.

PHOSPHORIC ACID. PHOSPHOROUS or PHOSPHOREOUS ACID. To understand the nature of these two acids more clearly, the reader should commence with the article PHOSPHORUS, as the basis from which they are produced; but which, though it takes the lead in scientific study, we have been compelled to introduce subsequently, or we should have broken through the order of the alphabet.

Phosphorus, like sulphur, and azote, forms an acid with two different proportions of oxygen. Combined with a maximum of oxygen it constitutes phosphoric acid; with a smaller proportion the result is phosphorous acid. Some chemists have supposed that there is a very close degree of analogy between the manner in which these two acids are produced, and the relation they bear to each other, and the nitric and nitrous, conceiving that the phosphorous acid is nothing more than the phosphoric holding some uncombined phosphorus in solution, in the same way as the nitrous acid may be considered as the nitric holding dissolved nitrous gas; or in other words, that all the oxygen of the phosphorous acid is combined

with a part only of the phosphorus, and in the proportions in which phosphoric acid is constituted; and that the superabundant phosphorus of the phosphorous acid is only in loose combination with the remainder. Perhaps this is the proper way of considering the subject; for though the phosphorous acid cannot be made by digesting phosphorus in the phosphoric acid, the former acid may be converted into the latter by mere heat, which drives off the excess of phosphorus.

Both these acids remained unknown till after the discovery of phosphorus. Boyle is perhaps the first chemist who notices even the phosphoric acid; but Margraff earliest examined its properties, and demonstrated it to be an acid of a peculiar kind. These properties were afterwards still farther and more completely investigated by Bergman, Scheele, Lavoisier, Pearson, Fourcroy, and Vauquelin, as well as various other distinguished chemists.

Phosphorous acid is produced by the slow combustion of phosphorus in atmospheric air; or that combustion which is excited in all the common temperatures at which phosphorus becomes simply luminous without bursting into flame. It may be safely performed in small quantities at any heat below the melting point of phosphorus.

Phosphorous acid is conveniently prepared according to Peltier's method. Inclose sticks of phosphorus, each in a small glass tube, quite open at one end, and drawn out to a capillary tube at the other. Arrange any number of these in a glass funnel, with the smaller end of the tube downwards, and set the funnel in an empty glass bottle. The contact of the air instantly begins the slow combustion of the phosphorus, and a luminous vapour arises from each tube. But if this vapour, which is phosphorized azote in the act of union with oxygen, is allowed to disperse freely in the air, most of the phosphorus would be wasted away and lost: so that it is found necessary to confine it by setting the bottle and funnel on a plate with a little warm water at bottom, and inverting over the whole a large glass bell, with an opening in the middle, loosely corked, through which sufficient air may be let in from time to time to maintain the slow combustion of the phosphorus that is inclosed. In this way the phosphorus gradually deliquesces into a liquid acid, which falls in drops through the tube and funnel into the vessel below. About three times the weight of the phosphorus employed may be collected. The use of confining each stick of phosphorus in a separate tube is to guard against the dangerous accident of the whole phosphorus taking fire; for though a single stick of it may be exposed to any natural temperature without kindling, it has been found that when a number of sticks are heaped together and exposed to the air from 65° to 70° , so much heat is generated by the slow combustion as to cause the whole to inflame, which might be productive of the most serious consequences.

The acid which drops from the phosphorus in this process is the phosphorous or phosphoreous as it is often called, and is a transparent liquor of the consistence of syrup, streaky when shaken, without smell, and with a strongly acid and peculiar taste. When heated in a retort it first thickens by the loss of its superfluous water; after which a number of bubbles arise to the surface, and break with a white smoke, which is luminous in the dark, smells strongly of phosphuretted hy-

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drogen, and sometimes actually takes fire. In an open vessel these bubbles kindle the instant they reach the surface. By continuing the heat for a considerable time all the superfluous phosphorus is burnt off, and the liquor is now converted into phosphoric acid.

Phosphoreous acid added to such of the metals as disengage hydrogen during solution, such as iron and zinc, dissolves them with the production of a fetid gas, luminous in the dark, but not inflammable *per se*, which is hydrogen, holding a very small portion of phosphorus in solution, or what may be termed sub-phosphuretted hydrogen. The residue is the phosphat of the metal employed.

This acid mixes with water in all proportions, and cannot be rendered solid by evaporation without losing the excess of phosphorus, which distinguishes it from the phosphoric.

Phosphoric acid is found native in several states of combination, particularly with lead and lime, and it composes a great part of the earth of bones, whence it is extracted in making PHOSPHORUS, which see; but it is never found native uncombined with a base.

There are two methods of preparing it; one directly from phosphorus, the other by the decomposition of phosphat of lime. The former gives it more certainly in a state of absolute purity.

Phosphoric acid is produced by the rapid combustion of phosphorus in oxygen, which may be done either over mercury or water. After combustion, which gives intense heat, and light, the acid sublimes in white crystalline flakes, that concrete on the inner surface of the vessel, and which soon deliquesce into a very strong acid. If this be done over water, it should be over a very thin stream of this fluid, and then by washing out the jar with it, all the acid mixes with the water, and may be concentrated by evaporation.

But the usual method of procuring this acid is by throwing phosphorus in small pieces at a time into hot nitric acid. A violent effervescence takes place, the phosphorus combines with oxygen, and nitrous gas is emitted. After the whole of the phosphorus is acidified, the liquid is to be evaporated to dryness, in order to drive off the remains of nitric acid which may not have been decomposed. This process was first put in practice by Lavoisier. Care must be taken not to apply too much heat nor to add too much phosphorus at once, and not to have the nitric acid too strong; otherwise the phosphorus will take fire, and perhaps break the vessels to pieces. When the acid thus prepared is concentrated and heated, it always emits a considerable quantity of phosphuretted hydrogen gas, which burns and occasions a considerable loss. The loss may be diminished by cautiously dropping nitric acid into the hot mass.

This acid may also be obtained from phosphat of lime in considerable quantity, by means of sulphuric acid and ammonia.

Phosphoric acid, in whatever way prepared, has the following properties. When concentrated as much as possible, retaining the liquid form, it is a thick unctuous looking fluid of the specific gravity of 2°, or sometimes more; strongly acid, but with no other taste, nor any smell. It is capable of the concrete form under certain circumstances. When produced by combustion in the way already mentioned it appears in crystalline flakes, but very deliquescent. The liquid acid

also, when of 2° specific gravity, if kept for several days at 32° or thereabouts, will gradually deposit small needle crystals. Even in the summer this takes place when quite at rest, but in a longer period of time.

Phosphoric acid is entirely unaltered and fixed in the fire. When the liquid acid is heated it first parts with its water; then, the heat being continued, it becomes a clear gelatinous mass; and, at last, when the heat is raised to redness, it bubbles and swells, and finally settles into a clear colourless acid glass; which, however, is again soluble in water, and returns to its former state. The gelatinous acid is extremely deliquescent, and the vitreous acid in some degree; and by exposure to air they both return to the state of the unctuous liquid acid. The vitreous acid is a very powerful flux for all earthy and many metallic substances, and strongly acts upon earthen crucibles, so that in fact it can hardly be obtained absolutely pure unless melted in a platina crucible: the phosphoric and the boracic acids resemble each other so strongly in their unalterability in any fire, and their powerful action as a flux, that they have been thought to be the same substance under different modifications; but no experiments have as yet confirmed this opinion.

This acid is not acted upon by hydrogen or sulphur, but charcoal decomposes it entirely in a strong heat.

When in a liquid state it is capable of oxydising some of the metals, especially if assisted by heat, during which hydrogen gas escapes: whence it is obvious that the oxydisement is owing to the decomposition of water. In this manner it oxydises iron, tin, lead, zinc, antimony, bismuth, and manganese; on some of which, however, it acts very slowly. When fused with several of these metals, as tin, iron, and zinc, it is converted into phosphorus; a proof that they have a stronger affinity for oxygen.

It does not act upon gold, platinum, silver, copper, mercury, arsenic, cobalt, nickel. It appears, however, to have some action on gold in the dry way, as it is called; for when fused with gold-leaf it assumes a purple colour; a proof that the gold has been oxydised.

Phosphoric acid combines with alkalies, earths, and metallic oxyds, and forms with them salts known by the name of PHOSPHATS, which see.

The component parts of this acid have been ascertained in a more satisfactory manner than almost any other chemical compound. M. Lavoisier proved that 45 parts of phosphorus, when burnt in oxygen, absorbed about 69.375 parts of that gas, and produced about 114 parts of phosphoric acid. Hence it follows that this acid is composed of about

60 oxygen
40 phosphorus
100

or three parts of oxygen to two of phosphorus. Thirty grains of phosphorus, converted into an acid by nitric acid, and precipitated by lime, gave, according to Dr. Thomson, a precipitate that contained 79 grains of phosphoric acid. This would show phosphoric acid to be composed of

62 oxygen
38 phosphorus
100

a result which does not differ much from the preceding.

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This acid is too expensive to be brought into common use. If it could be procured at a cheap rate it might be employed with advantage, not only in several important chemical manufactures, but also in medicine, and perhaps even for purposes of domestic economy.

PHOSPHORUS OF KUNCKEL. (from *φωσ*, light, and *κρῆνω*, to carry.) This has hitherto been regarded as a simple combustible, and must be so regarded at present, though various experiments with very high degrees of Voltaic electricity appear to have detected that it is a compound, possessing hydrogen and oxygen with a peculiar base. In consistence it resembles wax; when pure it is nearly of the transparency of gum opal, of a colour varying from amber red to the faintest straw, highly combustible, and when oxygenated producing a strong and peculiar acid.

It was discovered by a German chemist of the name of Brandt, about a hundred and fifty years ago, and the preparation was long kept a lucrative secret in the hands of a few persons. It was however well known, from various facts that had escaped, that it was procured in some way or other from human urine; and it has at length been found that it is in consequence of this substance containing a peculiar salt, hence denominated phosphoric salt (a mixture of phosphorus and oxygen), that phosphorus can be procured from it; as it has also that it can in like manner be procured from any other animal substance impregnated with the same material; and consequently from the bones and crustaceous integuments of animals, in which it exists in a larger abundance, and which are now therefore usually employed for this purpose.

One of the earliest chemists next to Brandt who devoted his attention in a very considerable degree towards obtaining this combustible was Kunckel. This chemist had seen the new product soon after its discovery by Brandt; and strongly desirous of possessing the secret, he associated himself with a friend of Brandt's, whose name was Krafft, through whom he made an offer to purchase the discovery of its inventor. Brandt consented to disclose it; but Krafft, instead of benefiting his colleague by the communication, paid the money, and retained the secret to himself.

Kunckel at this time knew nothing more of the preparation than that it was obtained by a series of processes from urine, through the medium of fire; and with this brief and unsatisfactory outline he set to work, and was at length fortunate enough to discover the method for himself; on which account the substance long went under the name of Kunckel's phosphorus. Mr. Boyle is also considered as one of the discoverers of phosphorus. He communicated the secret of the process of preparing it to the Royal Society of London in 1680. It is asserted, indeed, by Krafft, that he discovered the secret to Mr. Boyle, having in the year 1678 carried a small piece of it to London to show it to the royal family; but there is little probability that a man of such integrity as Mr. Boyle would claim the discovery of the process as his own, and communicate it to the Royal Society, if this had not been the case. Mr. Boyle communicated the process to Godfrey Hankwitz, an apothecary of London, who for many years supplied Europe with phosphorus, and hence it went under the name of English phosphorus. In the year 1774, the Swedish chemists, Gahn and Scheele, made the important discovery, that phosphorus is contained in the bones of animals, and they improved the processes or procuring it.

The most convenient process for obtaining phosphorus seems to be that recommended by Fourcroy and Vauquelin, which we shall transcribe. Take a quantity of burnt bones, and reduce them to powder. Put 100 parts of this powder into a porcelain or stone-ware bason, and dilute it with four times its weight of water. Forty parts of sulphuric acid are then to be added in small portions, taking care to stir the mixture after the addition of every portion. A violent effervescence takes place, and a great quantity of air is disengaged. Let the mixture remain for twenty-four hours, stirring it occasionally, to expose every part of the powder to the action of the acid. The burnt bones consist of the phosphoric acid and lime; but the sulphuric acid has a greater affinity for the lime than the phosphoric acid. The action of the sulphuric acid uniting with the lime, and the separation of the phosphoric acid, occasion the effervescence. The sulphuric acid and the lime combine together, being insoluble, and fall to the bottom. Pour the whole mixture on a cloth filter, so that the liquid part, which is to be received in a porcelain vessel, may pass through. A white powder, which is the insoluble sulphate of lime, remains on the filter. After this has been repeatedly washed with water, it may be thrown away; but the water is to be added to that part of the liquid which passed through the filter. Take a solution of sugar of lead in water, and pour it gradually into the liquid in the porcelain bason. A white powder falls to the bottom, and the sugar of lead must be added so long as any precipitation takes place. The whole is again to be poured upon a filter, and the white powder which remains is to be well washed and dried. The dried powder is then to be mixed with one-sixth of its weight of charcoal powder. Put this mixture into an earthen-ware retort, and place it in a sand bath, with the beak plunged into a vessel of water. Apply heat, and let it be gradually increased, till the retort becomes red hot. As the heat increases, air-bubbles rush in abundance through the beak of the retort, some of which are inflamed when they come in contact with the air at the surface of the water. A substance at last drops out similar to melted wax, which congeals under the water. This is phosphorus. To have it quite pure, melt it in warm water, and strain it several times through a piece of shamoy leather under the surface of the water. To mould it into sticks, take a glass funnel with a long tube, which must be stopped with a cork. Fill it with water, and put the phosphorus into it. Immerse the funnel in boiling water, and when the phosphorus is melted, and flows into the tube of the funnel, then plunge it into cold water, and when the phosphorus has become solid, remove the cork, and push the phosphorus from the mould with a piece of wood. Thus prepared, it must be preserved in close vessels, containing pure water. When phosphorus is perfectly pure, it is semi-transparent, and has the consistence of wax. It is so soft, that it may be cut with a knife. Its specific gravity is from 1.77 to 2.03. It has an acrid and disagreeable taste, and a peculiar smell, somewhat resembling garlic.

When a stick of phosphorus is broken, it exhibits some appearance of crystallization. The crystals are needle-shaped, or long octahedrons; but to obtain them in their most perfect state, the surface of the phosphorus, just when it becomes solid, should be pierced, that the internal liquid phosphorus may flow out, and leave a cavity for their formation. When phosphorus is exposed to the

PHOSPHORUS.

light it becomes of a reddish colour, which appears to be an incipient combustion. It is therefore necessary to preserve it in a dark place. At the temperature of 99° it becomes liquid, and if air be entirely excluded, evaporates at 219° , and boils at 554 . At the temperature of 43° or 44° , it gives out a white smoke, and is luminous in the dark. This is a slow combustion of the phosphorus, which becomes more rapid as the temperature is raised. When phosphorus is heated to the temperature of 148° it takes fire, burns with a bright flame, and gives out a great quantity of white smoke. Phosphorus enters into combination with oxygen, azote, hydrogen, and carbon. Phosphorus is soluble in oils, and when thus dissolved forms what has been called liquid phosphorus, which may be rubbed on the face and hands without injury. It dissolves too in ether, and a very beautiful experiment consists in pouring this phosphoric ether in small portions, and in a dark place, on the surface of hot water. The phosphoric matches consist of phosphorus extremely dry, minutely divided, and perhaps a little oxygenized. The simplest mode of making them is to put a little phosphorus, dried by blotting paper, into a small phial; heat the phial, and when the phosphorus is melted turn it round, so that the phosphorus may adhere to the sides. Cork the phial closely, and it is prepared. On putting a common sulphur match into the bottle, and stirring it about, the phosphorus will adhere to the match, and will take fire when brought out into the air.

The white smoke given forth by phosphorus when exposed to a heat of 148° , appears when collected and examined to be an acid of a peculiar kind, and it is this acid which is now denominated phosphoric acid.

Phosphorus combines readily with sulphur, and the two substances are capable of being mixed in different proportions. Seventy-two grains of phosphorus and nine of sulphur when heated in about four ounces of water melt with a gentle heat. The compound remains fluid till it is cooled down to 77° , and then becomes solid: these substances have also been combined in the same manner in the following proportions.

4 Phosphorus	}	this compound congeals at 59°
1 Sulphur		
4 Phosphorus	}	 50
2 Sulphur		
4 Phosphorus	}	 41
4 Sulphur		
4 Phosphorus	}	 99
12 Sulphur		

When the phosphorus predominates, the compound is called phosphuret of sulphur; and when the sulphur predominates, it is called, on the contrary, sulphuret of phosphorus.

Phosphor and sulphur may be combined also by melting them together without any water: but the combination takes place so rapidly that they are apt to rush out of the vessel if the heat be not extremely moderate. Phosphorus is likewise capable of combining with many other bodies; in which cases the products are called phosphurets of the body employed. See PHOSPHURETS.

The affinities of phosphorus have not yet been ascertained.

PHOSPHORUS (Medicinal use of). The earliest account we have concerning the medicinal use of phosphorus is in the seventh volume of Haller's Collection of Theses, relating to the history and cure of diseases. The original dissertation is en-

titled *De Phosphori Loco Medicamenti adsumpti virtute medica*, aliquot casibus singularibus confirmata, Auctore J. Gabi Mentz. There are three cases of singular cures performed by means of phosphorus narrated in this thesis; but as the work is in the library of many medical men in this country, it is not deemed necessary to translate those cases fully. It may be proper to premise, however, that the history of these cases and cures was sent to Dr. Gabi Mentz by his father.

The first history is of a man who laboured under a putrid fever; for whom the best alexipharmic medicines, as they are called, together with a proper regimen, were prescribed. A diarrhoea, however, ensued, accompanied with great anxiety about the præcordia, delirium, and general prostration of the powers of life. Proper remedies were tried to stop the diarrhoea, and check the disease, but in vain. For three days the patient had been insensible and exhausted. In this extremity, the physician had recourse to phosphorus; two grains of which were exhibited, together with a sufficient quantity of theriaca to make them into a bolus. This occasioned a gentle sweat, and general quiet. The dose was twice repeated in the evening, and again towards morning, with the addition of another grain. The sweat became copious, and the memory and the use of the external senses were restored. The patient, thus revived, was afterwards completely re-established by other remedies.

The second case is that of a man who laboured under a bilious fever. Although various remedies appear to have been judiciously employed, yet the disease gained ground, until at last the patient was almost quite exhausted. Three grains of phosphorus were exhibited at eleven o'clock in the forenoon, which produced a little quiet; but the patient became so thirsty that he could not refrain from drinking. After this he was quiet for two hours, and a profuse sweat broke out all over his body. The physician seeing this, ordered him another dose in the evening. He slept and perspired the whole evening, and, by means of proper remedies, was afterwards completely cured.

The third case is entitled, *A malignant catarrhal fever, with petechia*. It seems to have been the common typhus putridus of Cullen, accompanied with cough and catarrhal symptoms in the beginning. We are informed, that on the third day of the disease the patient was deprived of the use of his external senses; that he became delirious, and exceedingly exhausted. Two grains of phosphorus were given to him at two o'clock, and two more in the evening, which restored him to his senses, and occasioned a copious sweat. Proper remedies were afterwards employed, which accomplished his recovery.

Dr. Mentz appears to have been one of the first practitioners who tried this heroic remedy internally. Dr. Morgenstern and Dr. Hatman seem both to have afterwards employed it.

Other interesting accounts of the prodigious powers of phosphorus have been published by Dr. Wolf (in his inaugural oration at Gottingen in 1791), by Dr. Weickard, and M. Alphonso Leroi: the latter writer affirms that the divisibility of phosphorus is almost infinite; and in proof of this assertion he states, that "the body of a woman who died of a putrid fever, and who had taken one grain of phosphorus, was entirely luminous within. The hands of the late Ruelle, the anatomist,

who opened the body, were luminous some hours after they had been washed!?"

Upon maturely considering all the facts which have been brought forward concerning it, little room for doubt will be left in the mind as to its uncommon powers; but, although this be granted, experience is still wanting to point out the diseases, and various stages of disease, in which it may be employed with equal safety and utility, as also to determine the circumstances under which it would be dangerous even to try it. Thus much may doubtless be asserted concerning it, that it is one of the highest stimuli which we have in the catalogue of the materia medica; and that although it is affirmed by M. Leroi, and others, to be "calming and sedative," it is only so in such cases as wine, ether, Hoffman's anodyne liquor, and opium, are also found to be calming and sedative, that is, in cases where the arterial action of the whole frame is nearly exhausted, although still quick. Every practitioner should be cautioned against exhibiting it in any inflammatory disease, where much strength exists; and, in all cases, very small doses should be first exhibited, and those with the utmost circumspection.

PHOSPHURETS. (*phosphuretum*, from *phosphorus*.) Combinations of phosphorus, not oxygenated, with different bases; as, phosphuret of copper, phosphuret of iron, &c.

PHOSPHURETTED HYDROGEN, phosphorus dissolved in hydrogen gas; which may be done by introducing phosphorus into a glass jar of hydrogen gas standing over mercury, and then melting it by means of a burning glass; the gas dissolves a large proportion of it. The compound has a very fetid odour, something like that from putrid fish. When it comes into contact with common air, it burns with great rapidity, and if mixed with that air it detonates violently. Oxygen gas produces a still more rapid and brilliant combustion than common air. When bubbles of it are made to pass up through water, they explode in succession as they reach the surface of the liquid; a beautiful column of white smoke is formed. This gas is the most combustible substance known. Its combustion is the combination of its phosphorus and hydrogen with the oxygen of the atmosphere, and the products are phosphoric acid and water. These substances, mixed or combined, constitute the white smoke.

This substance was discovered by M. Genèmbre; and in 1783 by Mr. Kirwan, before he became acquainted with the experiments of Genèmbre. But for the fullest investigation of its properties we are indebted to Mr. Raymond, who published a dissertation on it in 1791, and another in 1800. These philosophers, indeed, obtained the gas by a different and more operose process, but in whatever manner it is prepared its properties are always the same.

When electric explosions are passed through this gas, its bulk is increased precisely as happens to carburetted hydrogen: the water which it contains is decomposed, phosphoric acid formed, and hydrogen gas evolved. We are neither acquainted with the specific gravity nor with the proportion of the constituents of this gas.

PHOTOMETER, an apparatus for measuring the intensity of light, and likewise the transparency of the medium through which it passes. Instruments for these purposes have been invented by M. de Saussure, Count Rumford, Mr. Leslie, &c. Professor Leslie's is indeed the simplest instrument of the kind of

which we have any where met with a description; but it measures only the momentary intensities of light; and he who wishes to be informed of its construction, will find that information in the third volume of Nicholson's Philosophical Journal, 4to, or in the professor's interesting work on the nature of heat.

PHOTOPHOBIA. (*φωτοφωβία*, from *φως*, light, and *φοβω*, to dread.) Such an intolerance of light, that the eye, or rather the retina, can scarcely bear its irritating rays. Such patients generally wink, or close their eyes in light, which they cannot bear without exquisite pain, or confused vision. The proximate cause is too great a sensibility in the retina. The species are; 1. Photophobia inflammatoria, or dread of light from an inflammatory cause, which is a particular symptom of the internal ophthalmia. 2. Photophobia, from the disuse of light, which happens to persons long confined in dark places or prisons; on the coming out of which into light, the pupil contracts, and the persons cannot bear light. The depression of the cataract occasions this symptom, which appears as though fire and lightning entered the eye, not being able to bear these strong rays of light. 3. Photophobia nervea, or a nervous photophobia, which arises from an increased sensibility of the nervous expansion and optic nerve. It is a symptom of the hydrophobia, and many disorders, both acute and nervous. 4. Photobia, from too great light, as looking at the sun, or at the strong light of modern lamps.

PHOTOPSIA. (*φωτοψία*; from *φως*, light, and *ψία*, vision.) Lucid vision. An affection of the eye in which the patient perceives luminous rays, ignited lines, or coruscations.

PHRAATES 1st, a king of Parthia, who succeeded Arsaces the 3d, called also Phriapatus. He made war against Antiochus, king of Syria, and was defeated in three successive battles. The 2d succeeded his father Mithridates as king of Parthia. He was murdered by some Greek mercenaries who had been once his captives, and who had enlisted in his army, B. C. 129. The 3d succeeded his father Pacorus on the throne of Parthia. Soon after he invaded the kingdom of Armenia, to make his son-in-law sit on the throne of his father. His expedition was attended with ill success. At his return to Parthia he was assassinated by his sons Orodes and Mithridates. The 4th was nominated king of Parthia by his father Orodes, whom he soon after murdered, as also his own brothers. He made war against M. Antony with great success, and obliged him to retire with much loss. Some time after he was dethroned by the Parthian nobility, but he soon regained his power, and expelled the usurper, called Titidates. He afterwards gained the friendship and protection of Augustus, and restored the Roman ensigns which the Parthians had taken from Crassus and Antony, and gave up his four sons with their wives as hostages, till his engagements were performed. He was, however, at last murdered by one of his concubines, who

placed her son, called Phraatices, on the throne.

PHRAATICES, a son of Phraates 4th, king of Parthia, who, with his mother, murdered his father, and took possession of the throne. His reign was short; he was deposed by his subjects, whom he had offended by cruelty and oppression.

PHRAORTES succeeded his father Deioces on the throne of Media. He made war against the neighbouring nations, and conquered the greatest part of Asia. He was defeated and killed in a battle by the Assyrians, after a reign of 22 years, B. C. 625.

PHRASE. *s.* (φρασις.) 1. An idiom; a mode of speech peculiar to a language. 2. An expression; a mode of speech (*Tillotson*). 3. Style; expression (*Shakspeare*).

To **PHRASE**. *v. a.* (from the noun.) *To* style; to call; to term (*Shakspeare*).

PHRASEOLOGY. *s.* (φρασις and λογω.) 1. Style; diction (*Swift*). 2. A phrase book (*Ainsworth*).

PHREATIS, or **PHREATTIUM**, in Grecian antiquity, was a court belonging to the civil government of Athens, situated upon the sea-shore, in the Piræus. The name is derived from *απο τη φρεως*, because it stood in a pit; or, as others suppose, from the hero Phreatus. This court heard such causes as concerned persons who had fled out of their own country for murder, or those that fled for involuntary murder, and who had afterwards committed a deliberate and wilful murder.

PHRENES. (from φρεν, the mind, because the ancients imagined it was the seat of the mind.) The diaphragm. See **DIAPHRAGM**.

PHRENETIC. **PHRENTIC**. *a.* (φρενιτικός; *phrenetique*, French.) Mad; inflamed in the brain; frantic (*Woodward*).

PHRENIC NERVE. (*nervus phrenicus*, from φρενς, the diaphragm.) Diaphragmatic nerve. It arises from a union of the branches of the third, fourth, and fifth cervical pairs, on each side, passes between the clavicle and subclavian artery, and descends from thence by the pericardium to the diaphragm.

PHRENITE, a species of zeolite. See **ZEOLITHUS**.

PHRENITIS. (φρενιτις; from φρεν, the mind.) Phrenzy or inflammation of the brain. A genus of disease in the class pyrexiae, and order phlegmasiæ of Cullen; characterized by strong fever, violent headach, redness of the face and eyes, impatience of light and noise, watchfulness, and furious delirium. It is symptomatic of several diseases, as worms, hydrophobia, &c. Phrenitis often makes its attacks with a sense of fullness in the head, flushing of the countenance, and redness of the eyes, the pulse being full, but in other respects natural. As these symptoms increase, the patient becomes restless, his sleep is disturbed, or wholly forsakes him. It sometimes comes on, as in the epidemic, of which Saalman gives an account, with pain, or a peculiar sense of uneasiness of the head, back, loins, and joints; in some cases, with tremor of their limbs,

and intolerable pains of the hands, feet, and legs. It now and then attacks with stupor, and rigidity of the whole body, sometimes with anxiety and a sense of tension referred to the breast, often accompanied with palpitation of the heart. Sometimes nausea and a painful sense of weight in the stomach are among the earliest symptoms. In other cases, the patient is attacked with vomiting, or complaints of the heart-burn, and griping pains in the bowels. When the intimate connection which subsists between the brain and every part of the system is considered, the variety of the symptoms attending the commencement of phrenitis is not so surprising, nor that the stomach in particular should suffer, which so remarkably sympathizes with the brain. These symptoms assist in forming the diagnosis between phrenitis and synocha. The pain of the head soon becomes more considerable, and sometimes very acute. "If the meninges," says Dr. Fordyce, "are affected, the pain is acute; if the substance only, obtuse, and sometimes but just sensible." And Dr. Cullen remarks, "I am here, as in other analagous cases, of opinion, that the symptoms above mentioned of an acute inflammation, always mark inflammations of membranous parts, and that an inflammation of paranchyma, or substance of viscera, exhibits, at least commonly, a more chronic inflammation."

The seat of the pain is various: sometimes it seems to occupy the whole head; sometimes, although more circumscribed, it is deep-seated, and ill-defined. In other cases it is felt principally in the forehead or occiput. The redness of the face and eyes generally increases with the pain, and there is often a sense of heat and throbbing in the head, the countenance acquiring a peculiar fierceness. These symptoms for the most part do not last long before the patient begins to talk incoherently, and to show other marks of delirium. Sometimes, however, Saalman observes, delirium did not come on till the fifth, sixth, or seventh day. The delirium gradually increases, till it often arrives at a state of phrenzy. The face becomes turgid, the eyes stare, and seem as if bursting from their sockets, tears, and sometimes even blood, flowing from them; the patient in many cases resembling a furious maniac, from whom it is often impossible to distinguish him, except by the shorter duration of his complaint. The delirium assists in distinguishing phrenitis and synocha, as it is not a common symptom in the latter. When delirium does attend synocha, however, it is of the same kind as in phrenitis.

We should, *a priori*, expect in phrenitis considerable derangement in the different organs of sense, which so immediately depend on the state of the brain. The eyes are incapable of bearing the light, and false vision, particularly that termed *muscæ volitantes*, and flashes of light seeming to dart before the eyes, are frequent symptoms. The hearing is often so acute, that the least noise is intolerable; sometimes, on the other hand, the patient becomes

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deaf; and the deafness, Saalman observes, and morbid acuteness of hearing, sometimes alternate. Affections of the smell, taste, and touch, are less observable.

As the organs of sense are not frequently deranged in synocha, the foregoing symptoms farther assist the diagnosis between this complaint and phrenitis.

The pulse is not always so much disturbed at an early period, as we should expect from the violence of the other symptoms, compared with what we observe in idiopathic fevers. When this circumstance is distinctly marked, it forms, perhaps, the best diagnosis between phrenitis and synocha, and gives to phrenitis more of the appearance of mania. In many cases, however, the fever runs as high as the delirium; then the case often almost exactly resembles a case of violent synocha, from which it is the more difficult to distinguish it, if the pulse be full and strong. In general, however, the hardness is more remarkable than in synocha, and in many cases the pulse is small and hard, which may be regarded as one of the best diagnostics between the two complaints, the pulse in synocha being always strong and full. In phrenitis it is sometimes, though rarely, intermitting. The respiration is generally deep and slow, sometimes difficult, now and then interrupted with hiccup, seldom hurried and frequent; a very unfavourable symptom. In many of the cases mentioned by Saalman, pneumonia supervened.

The deglutition is often difficult, sometimes convulsive. The stomach is frequently oppressed with bile, which is an unfavourable symptom; and complete jaundice, the skin and the urine being tinged yellow, sometimes supervenes. Worms in the stomach and bowels are also frequent attendants on phrenitis, and there is reason to believe, may have a share in producing it. The hydrocephalus internus, which is more allied to phrenitis than dropsy of the brain, properly so called, seems often, in part at least, to arise from derangement of the primæ viæ, particularly from worms. We cannot otherwise account for the frequent occurrence of these complaints.

Instead of a superabundance of bile in the primæ viæ, there is sometimes a deficiency, which seems to afford even a worse prognosis. The faces alvinæ being of a white colour, and a black cloud in the urine, are regarded by Lobb as fatal symptoms. The black cloud in the urine is owing to an admixture of blood: when unmixd with blood, the urine is generally pale.

There is often a remarkable tendency to the worst species of hæmorrhages, towards the fatal termination of phrenitis. Hæmorrhagy from the eyes has already been mentioned. Hæmorrhagy from the intestines also, tinging the stools with a black colour, is not uncommon. These hæmorrhages are never favourable; but the hæmorrhages characteristic of synocha, particularly that from the nose, sometimes occur at an earlier period, and, if copious, generally bring relief. More fre-

quently, however, blood drops slowly from the nose, demonstrating the violence of the disease, without relieving it. In other cases there is a discharge of thin mucus from the nose.

Tremors of the joints, convulsions of the muscles of the face, grinding of the teeth, the face from being florid suddenly become pale, involuntary tears, a mucus from the nose, the urine being of a dark red or yellow colour, or black, or covered with a pellicle, the faces being either bilious or white, and very fætid, profuse sweat of the head, neck, and shoulders, paralysis of the tongue, general convulsions, much derangement of the internal functions, and the symptoms of other visceral inflammations, particularly of pneumonia, supervening, are enumerated by Saalman as affording the most unfavourable prognosis. The delirium changing to coma, the pulse at the same time becoming weak, and the deglutition difficult, was generally the forerunner of death. When, on the contrary, there is a copious hæmorrhagy from the hæmorrhoidal vessels, from the lungs, mouth, or even from the urinary passages, when the delirium is relieved by sleep, and the patient remembers his dreams, when the sweats are free and general, the deafness is diminished or removed, and the febrile symptoms become milder, there are hopes of a recovery.

In almost all diseases, if we except those which kill suddenly, as the fatal termination approaches, nearly the same train of symptoms supervenes, viz. those denoting extreme debility of all the functions. Saalman remarks that the blood did not always shew the buffy coat.

Phrenitis, like most other complaints, has sometimes assumed an intermitting form, the fits coming on daily, sometimes every second day. When phrenitis terminates favourably, the typhus, which succeeds the increased excitement, is generally less in proportion to that excitement, than in idiopathic fevers; a circumstance which assists in distinguishing phrenitis from synocha.

The imperfect diagnosis between these complaints is further assisted by the effects of the remedies employed. For if in phrenitis in removing the delirium and other local symptoms, the febrile symptoms in general soon abate. Whereas in synocha, although the delirium and head-ach be removed, yet the pulse continues frequent, and other marks of indisposition remain for a much longer time.

It will be of use to present at one view the circumstances which form the diagnosis between phrenitis and synocha.

Synocha generally makes its attack in the same manner; its symptoms are few and little varied. The symptoms at the commencement of phrenitis are often more complicated, and differ considerably in different cases. Derangement of the internal functions are comparatively rare in synocha. In phrenitis it almost constantly attends, and often appears very early. The same observation applies to the derangement of the organs of sense. In synocha, the pulse from the commencement is frequent, slow, and rapid. In phrenitis, symp-

toms denoting the local affection often become considerable before the pulse is much disturbed. In phrenitis we have seen that the pulse sometimes very suddenly loses its strength, the worst species of hæmorrhages and other symptoms denoting extreme debility shewing themselves; such symptoms are generally the forerunner of death. But that when the termination is favourable, the degree of typhus which succeeds it is less in proportion to the preceding excitement in synocha. Lastly, if we succeed in removing the delirium and other symptoms affecting the head, the state of the fever is found to partake of this favourable change more immediately and completely than in synocha, where although we succeed in relieving the head-ach or delirium, the fever often suffers little abatement.

With regard to the duration of phrenitis, Eller observes, that when it proves fatal, the patient generally dies within six or seven days. In many fatal cases, however, it is protracted for a longer time, especially where the remissions have been considerable. Upon the whole, however, the longer it is protracted, providing the symptoms do not become worse, the better is the prognosis.

PHRENITIS, means also an inflammation of the diaphragm, within which region the mind was supposed to reside upon various theories of Grecian philosophy.

PHRENSY. *s.* (from *φρενις*; *phrenesie*, French.) Madness; franticness (*Milton*).

PHRYGANEÆ, in zoology, a genus of the class insecta, order neuroptera. Mouth with a horny, short, curved mandible; feelers four; stemmata three; antennæ setaceous, longer than the thorax; wings equal, incumbent, the lower ones folded. These are seen in a summer's evening floating in the air in large masses, and are eagerly devoured by swallows; they are easily distinguished from the smaller moths, by their wanting the spiral-tongue: the larvæ is six-footed, found at the bottom of shallow water, inclosed in a tube composed of sand, straws or small chips of wood, and is known to fishermen by the name of caddy or caddo: that of the first of the ensuing divisions is tailed with seven gills or fins; of the others slightly hairy with two claws on the tail, and three erect tentacles on the fourth segment; the pupæ resembles the perfect insect. Fifty-five species; a few American, the rest European insects; about twenty inhabitants of our own country. They are thus subdivided:

A. Tail with two truncate bristles: comprising the semblis of Fabricius, and consisting of only four species.

B. Tail bristleless: consisting of the rest.

The following are chiefly worthy of notice.

1. *P. grandis*. Wings brown, testaceous, with cinereous spots; measures rather more than an inch in length, and has very much the appearance of a phalæna. This is one of the largest species, and is the common caddy or cadow bait of anglers.

2. *P. rhombica*. Wings grey-brown, with rhombic whitish spots, smaller than the pre-

ceding. Larvæ inclosed in a web made of short pieces of grass laid transversely.

3. *P. bicaudata*. Frequents equally the banks of rivers and of standing pools; the wings a third longer than the body, narrow at the top, and broad below, and reticulated with brown veins; colour dark brown, with a single longitudinal streak passing across the head and thorax; antennæ long, filiform, and of the same colour as the legs and body; appendices of the tail of equal length with the antennæ.

4. *P. saltatrix*. One of the smallest species of the genus. Wings decorated each with a green and white spot; antennæ longer than the body; and when examined with a microscope, appearing velvety; wings hyaline; the small veins by which they are reticulated white at the base, and blackening towards their extremity.

PHRYGES, a river of Asia Minor, dividing Phrygia from Caria, and falling into the Hermus.

PHRYGIA, a country of Asia Minor, generally divided into Phrygia Major and Minor. It was situate between Bythia, Lydia, Cappadocia, and Caria. It received its name from the Eryges, a nation of Thrace, or Macedonia, who came to settle there, and from their name by corruption arose the word Phrygia. Cybele was the chief deity of the country, and her festivals were observed with the greatest solemnity. The invention of the pipe of reeds, and of all sorts of needlework, is attributed to the inhabitants.

The ancient Phrygians are described as superstitious, voluptuous, and effeminate, without any prudence or forecast, and of such a servile temper, that nothing but stripes and ill usage could make them comply with their duty; which gave rise to several trite and well known proverbs. They are said to have been the first inventors of divination by the singing, flying, and feeding of birds. Their music, commonly called the Phrygian mood, is oddly alleged by some as an argument of their effeminacy.

Their government was certainly monarchical; for all Phrygia was, during the reigns of some kings, subject to one prince. Ninnacus, Midas, Manis, Gordius, and his descendants, were undoubtedly sovereigns of all Phrygia. But some time before the Trojan war, we find this country divided into several petty kingdoms, and read of divers princes reigning at the same time. Apollodorus mentions a king of Phrygia contemporary with Ilius king of Troy. Cedrenus and others speak of one Teuthrans, king of a small country in Phrygia, whose territories were ravaged by Ajax, himself slain in single combat, his royal seat laid in ashes, and his daughter, by name Tecmessa, carried away captive by the conqueror. Homer makes mention of Phoreys and Ascanius, both princes and leaders of the Phrygian auxiliaries that came to the relief of Troy. Tantalus was king of Sipylus only, and its district; a prince no less famous for his great wealth, than infamous for his covetousness and other detestable vices. That Phrygia was subdued

either by Ninus, as Diodorus Siculus informs us, or by the Amazons, as we read in Suidas, is not sufficiently warranted. Most authors that speak of Gordius tell us, that the Phrygians having sent to consult an oracle in order to know how they might put an end to the intestine broils which rent their country into many factions and parties, received for answer, that the most effectual means to deliver themselves and their country from the calamities they groaned under was to commit the government to a king. This advice they followed accordingly, and placed Gordius on the throne.

PHRYGIAN, in music, an epithet applied by the ancients to that of their modes which held a middle place between the Lydian and Doric. So called because supposed to have been invented by the Phrygian, Marsyas. The Phrygian mode was one of the most ancient in the Greek music. Its character was bold, impetuous, and vehement to a degree perfectly terrific. In this mode the trumpets and other military instruments were used. The lowest note in this mode corresponded with our E natural on the third space in the bass.

PHRYMA, in botany, a genus of the class didynamia, order gymnospermia. Calyx two-lipped, five-toothed; seed one. Two species, herbs of North America and of the Cape.

PHRYNE, a celebrated prostitute who flourished at Athens about 328 years before the Christian era. She was mistress to Praxiteles, who drew her picture, which was one of his best pieces, and was placed in the temple of Apollo at Delphi. It is said that Apelles painted his Venus Anadyomene after he had seen Phryne on the sea shore naked, and with dishevelled hair.

PHRYNICUS, a tragic poet of Athens, disciple to Thespis. He was the first who introduced a female character on the stage.

PHRYNIS, a musician of Mitylene, the first who obtained a musical prize at the Panathenæa at Athens. He added two strings to the lyre, which had always been used with seven by all his predecessors, B. C. 438.

PHRYNIUM, in botany, a genus of the class monandria, order monogynia. Calyx three-leaved; petals three, equal, growing to the long channelled tube of the nectary; nectary one-leaved, with a filiform tube and four-parted border; capsule three-celled; nuts three. One species, a native of Malabar and China.

PHRYXUS, a son of Athamas, king of Thebes, by Nephele. After the repudiation of his mother, he was persecuted by his step mother Ino, because he was to sit on the throne, in preference to her own children. Being apprized of Ino's intentions upon his life, he secured part of his father's treasures, and privately left Bœotia with his sister Helle, to go to their friend Æetes king of Colchis. They embarked on board a ship, or according to the mythologists, they mounted on the back of a ram whose fleece was of gold, and pro-

ceeded through the air. The height to which they were carried made Helle giddy, and she fell into the sea. Phryxus gave her a decent burial, and after he had called the sea Hellespont from her name, he arrived safe in Colchis, where he offered the ram on the altars of Mars. The king received him with great tenderness, and gave him his daughter Chalciope in marriage. Some time after he was murdered by his father-in-law, who envied him the possession of the golden fleece. The fable of Phryxus has been explained by some who observe, that the ship, on which he embarked, was either called the ram, or carried on her prow the figure of that animal. The fleece of gold is explained by recollecting that Phryxus carried away immense treasures from Thebes. Phryxus was placed among the constellations of heaven after death. The murder of Phryxus gave rise to the celebrated Argonautic expedition, which had for its object the recovery of the golden fleece.

PTHIERIASIS. (*φθειρισις* from *φθειρ*, a louse.) The same as **PTHIRIASIS**, which see.

PTHIA, a town of Phthiotis, at the east of mount Othrys in Thessaly, where Achilles was born, and from which he is often called Phthius heros.

PTHIOTIS, a small province of Thessaly, between the Pelagæus sinus and the Maliacus sinus, Magnesia, and mount Cæta. It was also called Achaia.

PTHIRIASIS, (*φθιρίασις*, *φθειρισις*; from *φθειρ*, a louse.) A disease in which several parts of the body generate lice, which often puncture the skin, and produce little sordid ulcers.

PTHISICAL. *a.* (*φθιδιμος*.) Wasting, consuming.

PTHISIS. (*phthisis*, *φθισις*; from *φθιω*, to consume.) Pulmonary consumption. A genus of disease in the class pyrexia, and order hæmorrhagæ of Cullen; known by emaciation, debility, cough, hectic fever, purulent expectoration, hæmoptysis, diarrhœa. Species: 1. Phthisis incipiens, incipient, without any expectoration of pus. 2. Phthisis humida, with an expectoration of pus. 3. Phthisis scrophulosa, from scrophulous tubercles in the lungs, &c. 4. Phthisis hæmoptoica, from hæmoptysis. 5. Phthisis exanthematica, from exanthemata. 6. Phthisis chlorotica, from chlorosis. 7. Phthisis syphilitica, from a venereal ulcer in the lungs. The causes which predispose to this disease are very numerous. The following are, however, the most general: hereditary disposition; particular formation of body, and obvious by a long neck, prominent shoulders, and narrow chest; scrophulous diathesis, indicated by a fine clear skin, fair hair, delicate rosy complexion, large veins, thick upper lip, a weak voice, and great sensibility; certain diseases, such as syphilis, scrophula, the small pox, and measles; particular employments exposing artificers to dust, such as needle-pointers, stone-cutters, millers, &c. or to the fumes of metals or minerals under a confined and unwholesome air; violent pas-

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sions, exertions or affections of the mind, as grief, disappointment, anxiety, or close application to study, without using proper exercise; frequent and excessive debaucheries, late watching, and drinking freely of strong liquors: great evacuations, as diarrhæa, diabetes, excessive venery, fluor albus, immoderate discharge of the menstrual flux, and the continuing to suckle too long under a debilitated state; and lastly, the application of cold, either by too sudden a change of apparel, keeping on wet clothes, lying in damp beds, or exposing the body too suddenly to cool air, when heated by exercise; in short, by any thing that gives a considerable check to the perspiration. The more immediate or occasional causes of phthisis are, hæmoptysis, pneumonic inflammation proceeding to suppuration, catarrh, asthma, and tubercles, the last of which is by far the most general. The incipient symptoms usually vary with the cause of the disease; but when it arises from tubercles, it is usually thus marked: it begins with a short dry cough, that at length becomes habitual, but from which nothing is spit up for some time, except a frothy mucus that seems to proceed from the fauces. The breathing is at the same time somewhat impeded, and upon the least bodily motion is much hurried: a sense of straitness, with oppression at the chest, is experienced; the body becomes gradually leaner, and great languor, with indolence, dejection of spirits, and loss of appetite, prevail. In this state the patient frequently continues a considerable length of time, during which he is, however, more readily affected than usual by slight colds, and upon one or other of the occasions the cough becomes more troublesome and severe, particularly by night, and it is at length attended with an expectoration, which towards morning is more free and copious. By degrees the matter which is expectorated becomes more viscid and opaque, and now assumes a greenish colour and purulent appearance, being on many occasions streaked with blood. In some cases, a more severe degree of hæmoptysis attends, and the patient spits up a considerable quantity of florid, frothy blood. The breathing at length becomes more difficult, and the emaciation and weakness goes on increasing. With these, the person begins to be sensible of pain in some part of the thorax, which, however, is usually felt at first under the sternum, particularly on coughing. At a more advanced period of the disease a pain is sometimes felt on one side, and at times prevails in so high a degree, as to prevent the person from lying easily on that side; but it more frequently happens, that it is felt only on making a full inspiration, or coughing. Even where no pain is felt it often happens that those who labour under phthisis cannot lie easily on one or other of their sides, without a fit of coughing being excited, or the difficulty of breathing being much increased. At the first commencement of the disease, the pulse is often natural, or perhaps is soft, small, and a little quicker than usual; but when the symptoms which have

been enumerated have subsisted for any length of time, it then becomes full, hard, and frequent. At the same time the face flushes, particularly after eating; the palms of the hands and soles of the feet are affected with burning heat; the respiration is difficult and laborious; evening exacerbations become obvious, and by degrees the fever assumes the hectic form. This species of fever is evidently of the remittent kind, and has exacerbations twice every day. The first occurs usually about noon, and a slight remission ensues about five in the afternoon. This last is, however, soon succeeded by another exacerbation, which increases gradually until after midnight; but about two o'clock in the morning a remission takes place, and this becomes more apparent as the morning advances. During the exacerbations the patient is very sensible to any coolness of the air, and often complains of a sense of cold when his skin is, at the same time, preternaturally warm. Of these exacerbations, that of the evening is by far the most considerable. From the first appearance of the hectic symptoms, the urine is high coloured, and deposits a copious branny red sediment. The appetite, however, is not greatly impaired, the tongue appears clean, the mouth is usually moist, and the thirst is inconsiderable. As the disease advances, the fauces put on rather an inflamed appearance, and are beset with aphthæ, and the red vessels of the tunica adnata become of a pearly white. During the exacerbations, a florid circumscribed redness appears on each cheek; but at other times the face is pale, and the countenance somewhat dejected. At the commencement of hectic fever, the belly is usually costive; but in the more advanced stages of it, a diarrhæa often comes on, and this continues to recur frequently during the remainder of the disease; colliquative sweats likewise break out, and these alternate with each other, and induce vast debility. In the last stage of the disease the emaciation is so great, that the patient has the appearance of a walking skeleton; his countenance is altered, his cheeks are prominent, his eyes look hollow and languid, his hair falls off, his nails are of a livid colour, and much incurvated, and his feet are affected with œdematous swellings. To the end of the disease the senses remain entire, and the mind is confident and full of hope. It is, indeed, a happy circumstance attendant on phthisis, that those who labour under it are seldom apprehensive or aware of any danger; and it is no uncommon occurrence to meet with persons labouring under its most advanced stage, flattering themselves with a speedy recovery, and forming distant projects under that vain hope. Some days before death the extremities become cold. In some cases a delirium precedes that event, and continues until life is extinguished.

As an expectoration of mucus from the lungs may possibly be mistaken for purulent matter, and may thereby give us reason to suspect that the patient labours under a confirmed phthisis, it may not be amiss to point out a sure crite-

tion, by which we shall always be able to distinguish the one from the other. The medical world are indebted to the late Mr. Charles Darwin for the discovery, who has directed the experiment to be made in the following manner :

Let the expectorated matter be dissolved in vitriolic acid, and in caustic lixivium, and add pure water to both solutions. If there is a fair precipitation in each, it is a certain sign of the presence of pus ; but if there is not a precipitation in either, it is certainly mucus.

Mr. Everard Home, in his dissertation on the properties of pus, informs us of a curious, and apparently a decisive mode of distinguishing accurately between pus and animal mucus. The property, he observes, which characterises pus, and distinguishes it from most other substances, is, its being composed of globules, which are visible when viewed through a microscope ; whereas animal mucus, and all chemical combinations of animal substances appear in the microscope to be made up of flakes. This property was first noticed by the late Mr. John Hunter.

Pulmonary consumption is in every case to be considered as attended with much danger ; but it is more so when it proceeds from tubercles, than when it arises in consequence either of hæmoptysis, or pneumonic suppuration. In the last instance the risk will be greater where the abscess breaks inwardly, and gives rise to empyema, than when its contents are discharged by the mouth. Even cases of this nature have, however, been known to terminate in immediate death. The impending danger is generally to be judged of, however, by the violence of the hectic symptoms ; but more particularly by the fetor of the expectoration, the degree of emaciation and debility, the colliquative sweats, and the diarrhæa. The disease has, in many cases, been found to be considerably retarded in its process by pregnancy ; and in a few has been alleviated by an attack of mania.

The morbid appearance most frequently to be met with on the dissections of those who die of phthisis, is the existence of tubercles in the cellular substance of the lungs. These are small tumours which have the appearance of indurated glands, are of different sizes, and are often found in clusters. Their firmness is usually in proportion to their size, and when laid open in this state they are of a white colour, and of a consistence nearly approaching to cartilage. Although indolent at first, they at length become inflamed, and are at last changed into little abscesses or vomicæ, which breaking, and pouring their contents into the bronchiæ, give rise to a purulent expectoration, and thus lay the foundation of phthisis. Such tubercles or vomicæ are most usually situated at the upper and back part of the lungs ; but in some instances they occupy the outer part, and then adhesions to the pleura are often formed.

When the disease is partial, only about a fourth of the upper and posterior part of the lungs is usually found diseased ; but in some

cases life has been protracted till not one twentieth part of them appeared, on dissection, fit for performing their function. A singular observation, confirmed by the morbid collections of anatomists, is, that the left lobe is much oftener affected than the right.

PHU. (*φῦ*, or *φῦ*, from *phu*, Arab.) See VALERIANA MAJOR.

PHUL, or PUL, king of Assyria, is by some historians said to be Ninus under another name, and the first founder of that monarchy : a renowned warrior. He invaded Israel in the reign of Manahem, who became tributary to him, and paid him 1000 talents of silver for a peace. Flourished 771 B. C.

PHUT, or PHUTH, the third son of Ham. (Gen. x. 6.) Calmet is of opinion, that Phut peopled either the canton of Pthemphu Pthemphuti, or Pthembuti, set down in Pliny and Ptolemy whose capital was Thara in Lower Egypt, inclining towards Lybia ; or the canton called Phtenotes, of which Buthus was the capital. The prophets often speak of Phut.

PHYGETHLON. (*phygethlon* *φυγέθλον* ; from *φυγ*, to grow.) A red and painful tubercle which often arises about the anus, and if badly treated becomes fistulous.

PHYLACTERY, in the general, was a name given by the ancients to all kinds of charms, spells, or characters, which they wore about them, as amulets, to preserve them from dangers or diseases.

PHYLACTERY particularly denoted a slip of parchment, wherein was written some text of Holy Scripture, particularly of the decalogue, which the more devout people among the Jews wore on the forehead, the breast, or the neck, as a mark of their religion. The primitive Christians also gave the name phylacteries to the cases wherein they inclosed the relics of their dead. Phylacteries are often mentioned in the New Testament, and appear to have been very common among the Pharisees in our Lord's time.

PHYLICA. Bastard alaternus. In botany, a genus of the class pentandria, order monogynia. Perianth five-parted, turbinate ; petalless ; but five small scales, one at the base of each division of the calyx ; capsule three-grained, inferior. Eighteen species ; all Cape or African plants, of which the following are cultivated.

1. *P. ericoides*. Heath-leaved phylica.
2. *P. plumosa*. Woolly-leaved phylica.
3. *P. buxifolia*. Box-leaved phylica.

They are tender shrubby plants propagated by cuttings and slips, and require the shelter of a green-house in winter. They do not produce seeds in this climate.

PHYLLACHNE, in botany, a genus of the class diccia, order monandria. Calyx double ; each two or three-leaved ; corol funnel-form, five-cleft. Male : filamentless ; anthers two, placed on the sides of the stigma. Fem. : stigma between the barren anthers ; capsule inferior, turbinate, many-seeded. One species ; a mossy plant of Terra del Fuego, with terminal sessile flowers.

PHYLLANTHUS. Sea-side laurel. In botany, a genus of the class monocæia, order triandria. Calyx six-parted, campanulate; corolless. Fem.: styles three, cloven; capsules three-celled; seeds solitary. Eleven species, natives of the East and West Indies. The following species are cultivated.

1. *P. niruri*. Annual phyllanthus.
2. *P. grandiflora*. Great-leaved phyllanthus.

3. *P. emblica*. Shrubby phyllanthus.

All these require artificial heat, and rise from twelve to fourteen feet high.

PHYLLIS, a daughter of Sithon, or of Lycurgus, king of Thrace, received Demophoon the son of Theseus, who, at his return from the Trojan war, had stopped on her coasts. She became enamoured of him, and did not find him insensible to her passion. After some months of mutual tenderness and affection, Demophoon set sail for Athens. He promised faithfully to return as soon as a month was expired, but violated his engagement; and the queen, grown desperate on account of his absence, hanged herself, or, according to others, threw herself into the sea. The absence of Demophoon from Phyllis has given rise to a beautiful epistle of Ovid.

PHYLLIS. Bastard hare's ear. In botany, a genus of the class pentandria, order digynia. Stigmas bristly; calyx two-leaved; corol five-petalled; seeds two. One species; a jointed shrub of the Canaries, with spear-shaped leaves, and terminal flowers in loose panicles.

PHYLLITIS (*phyllitis*, *φυλλιτις*; from *φυλλοι*, a leaf so called because the leaves only appear.) See **SCOLOPENDRIUM**.

PHYMA, (*phyma*, *φυμα*; from *ενω*, to produce.) Tubercles in any external part of the body.

PHYSALIS. Winter-cherry. In botany, a genus of the class pentandria, order monogynia. Corol wheel-shaped; stamens connivent; berry within an inflated calyx, two-celled. Seventeen species; natives of the south of Europe, both the Indies, or America. The following are cultivated.

1. *P. angulata*. Tooth-leaved winter-cherry.

2. *P. pubescens*. Woolly winter-cherry.

3. *P. alkekengi*. Common winter-cherry.

4. *P. Pensylvanica*. Pennsylvanian winter-cherry.

5. *P. viscosa*. Clammy winter-cherry.

6. *P. somnifera*. Clustered winter-cherry.

7. *P. flexuosa*. Flexuous Italian winter-cherry.

8. *P. arborescens*. Tree-like winter-cherry.

9. *P. Curassavica*. Curassavian winter-cherry.

The flowers are produced from the wings standing upon slender foot-stalks, of a white colour, and confined to a single petal. These are succeeded by round, cherry-shaped berries, inclosed in an inflated bladder, which turns red in autumn; when the top opens and discloses the red berry, which is soft, pulpy, and filled with flat kidney-shaped seeds. These

plants are all propagable by seeds, and are for the most part hardy: some of them are annual, the greater part perennial.

PHYSALUS, in mastiology. See **BALÆNA**.

PHYSCON, a surname of one of the Ptolemies kings of Egypt, from the great prominence of his belly (*φυσων, venter*.)

PHYSCONIA, (*physconia*, *φυσκωνια*; from *φυσκων*, a big-bellied fellow.) Enlargement of the abdomen. A genus of disease in the class cachexiæ, and order intumescentiæ of Cullen; known by a tumour occupying chiefly one part of the abdomen, increasing slowly, and neither sonorous nor fluctuating. Species: 1. hepatica. 2. Splenica. 3. Renalis. 4. Uterina. 5. Ab ovario. 6. Mesenterica. 7. Omentalis. 8. Visceralis.

PHYSETER. Cachalot. In zoology, a genus of the class mammalia, order cetæ. Teeth in the lower jaw; none in the upper. Four species as follow:

1. *P. macrocephalus*. Blunt-headed cachalot. Without dorsal fin; fistula on the neck. Three varieties.

α. Black; back gibbous.

6. Blackish ash; back gibbous.

γ. Whitish; back smooth.

Variety α inhabits the European seas; 6 the coasts of New England; γ Davis's straits. The first is sixty feet long, white beneath; teeth in the lower jaw forty-six, in a double row, received in sockets in the upper; teats retractile; from its head is procured spermaceti, and ambergris from the intestines of such as are sick. The second variety is from sixty to seventy feet long; head large; eyes small; teeth numerous. The third is from fifteen to sixteen feet long, yellowish white; teeth a little incurvate, compressed, rounded at the tips.

The first sometimes visits the British coasts: a dead one was cast ashore near Edinburgh in 1769, length fifty-four feet, greatest girth thirty feet.

The formidable conformation of the mouth and throat seems to indicate an extraordinary degree of voracity in these animals. The history of the cachalot corresponds to these appearances: for while the stomach of the whale is seen to contain hardly any thing but froth, that of the cachalot is crammed with a variety of different kinds of fishes; some half digested, others whole; some small, others eight or nine feet long. The cachalot, therefore, is probably one of the most rapacious fishes of the deep; and as destructive among the lesser tribes as the whale is harmless. But it is not to the smaller fishes alone that this animal is formidable; among these the contest is soon ended, for it can devour thousands at one swallow; it pursues and terrifies those of its own order, the dolphin, and the porpoise to such a degree, that they are frequently driven ashore in endeavouring to escape.

All the varieties of this species were indiscriminately termed spermaceti whales, till Mr. Pennant borrowed the name from the French, by which they are now distinguished.

From its size, as well as its fierceness and agility, the capture of the cachalot would seldom be attempted by fishermen, were it not for the sake of the spermaceti and ambergris, which they contain. The various purposes to which these substances are applied, both as drugs and articles of luxury, have rendered the cachalot, which supplies them, a fish in great request, and its capture is the most advantageous pursuit of the Greenland trade.

Spermaceti is a name erroneously given to the substance which is found in the head of the cachalot, and which instead of being the semen, is the brain of the animal. Goldsmith gives the following account of the method by which it is extracted. The outward skin of the head being taken off, a covering of fat appears, about three inches thick; under which, instead of a bony skull, the animal has only another thick skin, that serves for a covering and defence of the brain. The first cavity or chamber of the brain is filled with that kind of spermaceti which is supposed to be of the greatest purity, and is hence of the highest value. From this cavity there is generally drawn about seven barrels, and so perfect is the material that when thrown upon water it will coagulate like cheese. Below this there is another chamber, just over the gullet, which is about seven feet high; and this also contains spermaceti, but of less value. It is distributed in this cavity, like honey in a bee-hive, in small cells, separated from each other by a membrane like the inner skin of an egg. In proportion as the oily substance is drawn away from this part, it fills afresh from every part of the body; and from this is generally obtained about nine barrels of oil. Besides this, the spinal marrow, which is about as thick as a man's thigh, and reaches all along the backbone to the tail, where it dwindles to the size of one's finger, affords no inconsiderable quantity.

Formerly spermaceti was obtained but in small quantities, and was sold at a very high price, from the supposition of its great efficacy as a medicine. It still enters indeed into the compositions of pharmacy, but in a very subordinate character; and since the art of converting the whole oil of the cachalot into spermaceti by boiling has been discovered, the article has decreased rapidly in its value. It has now fallen below the price of wax, and is used instead of it for candles.

Ambergris, the second medicinal substance for which mankind are indebted to the cachalot, should rather have obtained the name of spermaceti, because it is found in the place where the seminal vessels of other animals are commonly situated. For a long time the world was taught to believe that ambergris was a substance to be found only in small quantities upon the surface of the water. The trade in these articles was originally in the hands of men of obscure and suspicious characters; and this was one of the arts by which they endeavoured to add to the mysterious nature and value of the commodity. Time, which re-

veals the secrets of the mercenary, has at last discovered that this medicine is the produce of the cetaceous fishes.

Among the intestines of the cachalot is found a bag three or four feet long, filled with liquor of a yellowish colour, and thinner than oil; and in this fluid the ambergris is seen floating in round lumps, from one to twenty pounds weight, the lumps never exceeding above four in the same fish. These balls of ambergris, the purposes of which in medicine and perfumes are so well known, are not indiscriminately found in every cachalot; it is only the oldest and strongest that yield it in any considerable quantity. See the article AMBERGRIS.

2. *P. catodon*. Lesser cachalot. Round-headed cachalot. Without dorsal fin: fistula on the snout. Inhabits the northern seas, rarely the Scottish coast: twenty-four feet long; head round; mouth small.

3. *P. microps*. Sharp-nosed cachalot. Dorsal fin long; upper jaw longer than the lower. Two varieties.

a. Teeth sharp, hooked.

ε. Teeth sharp, straight.

Both inhabit the northern seas: the first seventy feet long, dark tawny; teeth forty-two, a little compressed; dorsal fin long, sharp. The second from eighty to a hundred feet long, blackish above, whitish beneath; a high bunch on the upper part of the back; fin near the tail; eyes bright, yellowish; tongue small, acute; teeth set in the jaw like a saw. Found at times on our own coasts.

4. *P. tursis*. High-finned cachalot. Dorsal fin very long; teeth flat at the top. Inhabits the northern ocean, and has been found on the Scottish coast: a hundred feet long; the long dorsal fin sharp, erect, resembling the mast of a vessel; tongue sharp.

PHYSIC (Φυσική), the art of healing; properly called medicine.

The word is formed from *φύσις*, nature; because medicine consists, principally, in the observation of nature. For the rise, progress, division, &c. of physic, see MEDICINE.

To PHY'SIC. *v. n.* (from the noun.) To purge; to treat with physic; to cure (*Shakspeare*).

PHYSIC NUT, in botany. See JATROPHA.

PHYSICAL. *a.* (from *physic*.) 1. Relating to nature or to natural philosophy; not moral (*Hammond*). 2. Pertaining to the science of healing. 3. Medicinal; helpful to health (*Shakspeare*). 4. Resembling physic.

PHYSICALLY. *ad.* (from *physical*.) 1. According to nature; by natural operation; not morally (*Stillingfleet*). 2. According to the science or rules of medicine (*Cheyne*).

PHYSICIAN. *s.* (from *physic*.) One who professes the art of healing (*Prior*).

PHYSICO-MATHEMATICS, includes those branches of physic, which, uniting observation and experiment to mathematical calculation, undertake to explain the phenomena of nature. See MIXED MATHEMATICS.

P H Y S I C S.

PHYSICO-THEOLOGY: *s.* (from *physico*, and *theology*.) Divinity enforced or illustrated by natural philosophy.

PHYSICS, *physica, φυσικη*, derived from *φύσις*, nature, sometimes also called *physiology*, and *natural philosophy*, is the doctrine of natural bodies, their phenomena, causes, and effects, with the various affections, motions, operations, &c. thereof.

Mr. Locke would likewise have God, angels, and spirits, come under physics; but these are more usually referred to metaphysics.

The immediate and proper objects of physics are body, space, and motion.

The origin of physics is referred, by the Greeks, to the barbarians, viz. the brachmans, magi, and the Hebrew and Egyptian priests.

From these it was derived to the Greek sages or sophi, particularly to Thales, who is said to have first professed the study of nature in Greece.

Hence it descended into the Pythagoric, Platonick, and Peripatetic schools; whence it was propagated into Italy, and thence through the rest of Europe: though the druids, bards, &c. had a sort of systems of physics of their own.

Physics has been divided, with regard to the manner wherein it has been handled, and the persons by whom, into

Symbolical Physics, or such as was couched in symbols: such was that of the old Egyptians, Pythagoreans, and Platonists, who delivered the properties of natural bodies under arithmetical and geometrical characters, and hieroglyphics.

Peripatetical, or that of the Aristotelians, who explained the nature of things by matter, form, and privation, elementary and occult qualities, sympathies, antipathies, attractions, &c. See ARISTOTELIAN and PERIPATETICS.

Experimental, which enquires into the reasons and natures of things from experiments; such as those in chemistry, hydrostatics, pneumatics, optics, &c. See EXPERIMENTAL PHILOSOPHY.

And, finally, *mechanical* or *corpuscular*, which explains the appearances of nature from the matter, motion, structure, and figure of bodies, and their parts; all according to the settled laws of nature and mechanics.

By the constitution of our mind, we consider the employment of means, by which ends terminating in the agent are gained, as the natural signs of design or intention. Art, therefore, or the employment of means, is the natural sign of intention; and wherever we observe this adjustment of means to ends we infer the agency of design.

A small acquaintance with the objects around us, obliges us to extend this inference to a great number of beings, besides our fellow men, namely, to the whole animal creation; for in all we observe the same subserviency to the ends of the agent, in the changes which we find them continually producing in the objects around them. These changes are all adjusted to their own well-being. In all such cases, therefore, we are forced, by the constitution of our own minds, to infer the existence of design or intention in these beings also.

But in numberless changes produced by external objects on each other, we observe no such fitness in the effects, no such subserviency to the well-being of the agent. In such cases, therefore, we make no such inference of thought or design.

Thus, then, there is presented to our observa-

tion an important distinction, by which we arrange all external objects into two classes. The first resembles ourselves, in giving external marks of that thought or intention of which we are conscious; and we suppose in them the other properties which we discover in ourselves, but cannot immediately observe in them, viz. thought, perception, memory, foresight, and all that collection of faculties which we feel in ourselves, and which constitute the animal. Objects of the other class exhibit no such appearances, and we make no such inference. And thus we divide the whole of external nature into the classes of thinking and unthinking beings.

Our first judgments about these classes will be very inaccurate; and we shall naturally ascribe the differences, which we do not very well understand, to the differences in organical structure, which we clearly observe. But when we have knocked down or perhaps smothered an animal, we find that it no longer gives the former marks of thought and intention, and that it now resembles the class of unthinking beings: and yet it still retains all that fitness of organical structure which it had before; it seems only to want the intention and the will. This obliges us to conclude that the distinction does not arise from a difference in organical structure, but from a distinct substance common to all thinking beings, but separable from their organical frame. To this substance we ascribe thought, intention, contrivance, and all that collection of faculties, which we feel in ourselves. To this substance in ourselves we refer all sensations, pleasures, pains, remembrances, desires, purposes; and to this aggregate, however imperfectly understood, we give the name *mind*. Our organical frame, which seems to be only the instrument of information and operation to the mind, we call our body.

As the animating principle is not, like our body, the immediate object of the senses, we naturally conceive it to be a substance essentially different from those which are the objects of our senses. The rudest people have shown a disposition to form this conclusion. Observing that animal life was connected with breathing, it was natural to imagine that breathing was living, and that breath was life. It is a remarkable fact that in most languages the term for expressing breath is at least one of the terms for expressing the soul; *πνεύμα*, *spiritus*, in the Hebrew, Greek, and Latin, express both; *ghetst* or *ghost*, in the Teutonic, comes from *gheisen*, to breathe or sigh; *ducha* or *duah*, the soul, in Slavonic, comes from *duichat*, to breathe; so in the Gaelic does *anal* come from *anam*; and the same relation is found between the two words in the Malay and other eastern languages. We believe that most persons can recollect some traces of this notion in their early conceptions of things; and many who do not consider themselves as uncultivated, believe that the soul quits the body along with the last breath. Among the Tartar nations hanging is considered with particular horror, on account of the ungraceful and filthy exit which the soul is obliged to make from the body.

But the observation of the same appearances of thought and intention in fishes and other animals which do not breathe would soon show that this was but a rude conception. Very little refinement indeed is necessary to convince us that air or breath cannot be the substance which thinks, wishes, and designs; and that the properties of this substance, whatever it is, must be totally different from, and

incompatible with, any thing that we know of the immediate objects of our senses.

Hence we are led to conclude that there are two kinds of substances in nature: one, which is the principle of sensation; and therefore cannot be the object of our senses, any more than light can be the object of the microscope. This substance alone can feel, think, desire, and propose, and is the object of reflection alone. The objects of our senses compose the other class, and therefore can have none of the other properties which are not cognoscible by the senses. These have all the properties which our senses can discover; and we can have no evidence of their having any other, nor indeed any conception of their having them. This class is not confined to the unorganized masses of matter; for we see that the bodies of animals lose after death that organical form, and are assimilated to all the rest of unthinking beings. It has arisen from such views as this, that while all nations have agreed to call this class of objects by the name body, which originally expresses our organical frame, some nations, further advanced in cultivation or refinement, have contrived an abstract term to express this general substance of which all inanimate beings are composed. Such a term we have in the words *materies*, *οὐκ*.

Matter, then, is that substance which is immediately cognoscible by our senses. Whatever, therefore, is not thus immediately cognoscible by our senses is not material, and is expressed by a negative term, and called immaterial: hence it is that mind is said to be immaterial. It is of importance to keep in mind this distinction, merely grammatical. Little more is necessary for detecting the sophisms of Helvetius, Mirabeau, and other sages of the Gallic school, who have been anxious to remove the ties of moral and religious obligation by lowering our conceptions of our intellectual nature. It will also serve to show how hastily they have formed their opinions who have ascribed to the immediate agency of mind all those relations which are observed in the actions of bodies on each other at a distance. The connecting principles of such relations *e distante* (if there are any such) are not the immediate objects of our senses: they are therefore immaterial. But it does not follow that they are minds. There may be many immaterial substances which are not minds. We know nothing of any object whatever but by the observation of certain appearances, which suggest to our minds the existence and agency of its qualities or powers. Such phenomena are the natural signs of these qualities, and it is to those signs that we must always have recourse when we wish to conceive without ambiguity concerning them. What is the characteristic phenomenon of mind, or what is the distinguishing quality which brings it into view? it is *intention*: and it may be asserted with the utmost confidence, that we have no other mark by which mind is immediately suggested to us, or that would ever have made us suppose that there existed another mind besides our own. The phenomenon by which this quality is suggested to us is art, or the employment of means to gain ends; and the mark of art is the supposed conduciveness of these ends to the well-being of the agent. Where this train is not observed, design or intention is never thought of; and therefore where intention is not perceived in any immaterial substance, if any such has ever been observed, it is an abuse of language to call it mind. We do not think that even perception and intelligence entitle us to give the name mind to

the substance in which they are inherent, because it is from marks of intention alone that we infer the existence of mind; and although these must be accompanied with perception and intelligence, it does not follow that the substance which can perceive and understand must also desire and propose. However difficult we may find it to separate them, they are evidently separable in imagination. And let not this assertion be too hastily objected to; for the separation has been made by persons most eminent for their knowledge and discernment. When Leibnitz ascribed to his monads, or what we call the ultimate atoms of matter, a perception of their situation in the universe, and a motion precisely suited to this perception, he was the furthest in the world from supposing them animated or endowed with minds.

The term mind, in the ordinary language of all men, is applied to what desires and wills at the same time that it perceives and understands. If we call that mind which produces motion, we must derive our notions of its qualities or attributes from observing their effects. We must therefore discover the general laws by which they act, that is, the general laws observed in those motions which we consider as their effects. Now these are the general laws of motion; and in none of these can we find the least coincidence with what we are accustomed to call the laws of mind. Nay, it has been the total want of similarity which has given rise to the distinction which all men, in all ages and countries, have made between mind and matter. This distinction is found in all languages; and it is an unpardonable liberty which men take with languages when they use a term of distinction, a specific term, to express things of a different species. What these authors have been pleased to call mind, the whole world besides have called by another name, force; which, though borrowed from our own exertions, is yet sufficiently distinctive, and never leads us to confound things that are different, except in the language of some modern philosophers, who apply it to the laws of the agency of mind; and, when speaking of the force of motives, &c. commit the same mistakes which the followers of Aristotle commit in the use of the term mind. Force, in the language of these philosophers, means what connects the operations of mind; as mind, in the language of lord Monboddo, is that which connects the operations of body.

Those are not less to blame who consider this nature of Aristotle, this principle of motion, as an existence of substance different both from matter and from the minds of intelligent creatures. Aristotle calls it in some places, *ωσπερ ψυχη*. He might with equal propriety, and equal consistency with his other doctrines, have called mind *ωσπερ τελος*, or an *ωσπερ, δυναμις*. Besides, we have no evidence for the separability of this *ωσπερ ψυχη* from body, as we have for the inseparability of such minds as our own, the genuine *ψυχαι*. Nay, his whole doctrines, when maturely considered, assume their absolute inseparability.

This doctrine of elemental minds, therefore, as the immediate causes of the phenomena of the material world, is an abuse of language. It is a jargon; and it is a frivolous abuse, for it offers no explanation whatever. The phenomena are totally unlike the phenomena of ordinary minds, and therefore receive no explanation from them; and since our knowledge of these *quasi* minds must be entirely derived from the phenomena, it will be precisely the same, although we express it in com-

mon language. We shall not indeed raise the wonder of our hearers, as those do who fill the world with minds which they never suspected to exist; but we shall not bewilder their imagination, confound their ideas, and mislead their judgments.

We flatter ourselves that our readers will not think these observations unseasonable or misplaced. Of all mistakes that the naturalist can fall into, there is none more fatal to his progress in knowledge than the confounding things which are essentially different; and of all the distinctions which can be made among the objections of our contemplation, there is none of equal philosophical importance with this between mind and matter: and when we consider the consequences which naturally follow from this confusion of ideas, and particularly those which follow from sinking the mental faculties of man to a level with the operations of mechanics or chemistry, consequences which the experience of the present eventful day shows to be destructive of all that is noble or desirable in human nature, and of all that is comfortable in this life, and which blast every hope of future excellence—we cannot be too anxious to have this capital distinction put in the plainest point of view, and expressed in the most familiar characters, “so that he who runs may read.”

Such is the scene of our observation, the subject of philosophical study. Its extent is almost unbounded, reaching from an atom to God himself. It is absolutely necessary for the successful cultivation of this immense field of knowledge that it be committed to the care of different cultivators, and that its various portions be treated in different ways: and, accordingly, the various tastes of men have given this curiosity different directions; and the study, like all other tasks, has been promoted by this division of labour.

Some philosophers have attended only to the appearances of fitness which are exhibited in every quarter of the universe; and by arranging these into different classes, and interpreting them as indications of thought and intention, have acquired the knowledge of many classes of sentient and intelligent beings, actuated by propensities, and directed by reason.

While the contemplation of these appearances indicates thought and design in any individual of one of these classes, and brings its propensities and purposes of action, and the ends gained by these actions, into view, the contemplation of these propensities, purposes, and ends, occasions an inference of a much more general kind. All these intelligent beings give indications of knowledge and of power; but their knowledge bears in general no proportion to their power of producing changes in nature, and of attaining important ends; and their power is neither always, nor in the most important cases, the consequence of their knowledge. Where the effect of their actions is most eminently conducive to their important interests, the power of attaining these valuable ends is generally independent on any attention to the fitness of the means, and the exertion is frequently made without even thinking of the important end. The well-being of the individual is secured against any danger from its ignorance, indolence, or inattention, by an instinctive propensity, which leads it to the performance of the necessary action, which is thus made immediately and ultimately desirable, without any regard to its ultimate and important end. Thus, in our own nature, the support of animal life, and the improvement of the means of subsistence by a knowledge of the objects

which surround us, are not intrusted to our apprehensions of the importance of these ends, but are committed to the surer guides of hunger and curiosity.

The same observers discover a connection between the individuals of a class, different from that which arises from the mere resemblance of their external appearance, or even of their propensities and pursuits: the very circumstances which produced the classification. They observe, that these propensities are such, that while each individual seeks only its own enjoyment, these enjoyments are in general such as contribute to the support of the species and the enjoyment of other individuals. Thus, in the classes of animals, and in human nature, the continuance of the race, and the enjoyment of the whole, are not entrusted to the apprehension we entertain of the importance of these ends, but are produced by the operation of sexual love and the love of society.

The same observers find that even the different classes of sentient beings are connected together; and while the whole of each class aim only at their own enjoyment, they contribute, in some way or other, to the well-being of the other classes. Even man, the selfish lord of this sublunary world, is not the unconnected inhabitant of it. He cannot, in every instance, reap all the fruits of his situation, without contributing to the enjoyment of thousands of the brute creation. Nay, it may be proved, to the satisfaction of every intelligent man, that while one race of animals, in consequence of its peculiar propensities, subsists by the destruction of another, the sum-total of animal life and enjoyment is prodigiously increased. See a very judicious dissertation on this curious and puzzling subject, entitled *A Philosophical Survey of the Animal Creation*; where it appears that the increase of animal life and enjoyment which is produced by this means, beyond what could possibly obtain without it, is beyond all conception. See likewise the last edition of *King's Origin of Evil*, by Dr. Law, late bishop of Carlisle.

Thus the whole assemblage seems connected, and jointly employed in increasing the sum-total of possible happiness. This fitness of the various propensities of sentient and intelligent beings, this subserviency to a general purpose, strikes these observers as a mark of intention, evidently distinct from, and independent of, all the particular intentions, and superior to them all; and thus it irresistibly leads them to infer the existence of a supreme mind, directing the whole of this intellectual system, while the individuals of which it consists appear the unconscious instruments in the hand of a great artist, with which he executes his grand and beneficent purposes.

But the observation goes yet further. The bodies of the inanimate creation are not only connected with each other by a mutual dependence of properties, and the relation of causation, but they are also connected with the sentient beings by a subserviency to their purposes of enjoyment. The philosopher observes that this connection is admirably kept up by the constancy of natural operations, and the expectations of intelligent beings. Had either of these circumstances been wanting, had either the operations of nature been without rule, or had sentient beings no perception or expectation of their uniformity, the subserviency would be totally at an end. This adjustment, this fitness, of which the effect is the enjoyment of the sentient inhabitants of the universe, appears to be the effect of an intention of which this enjoyment is

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the final cause. This constancy therefore in the operations of nature, both in the intellectual and material world, and the concomitant expectation of sentient beings, appear the effects of laws imposed on the different parts of the universe by the Supreme Mind, who has formed both these classes of beings so admirably suited to each other.

To such observers the world appears a work of art, a system of means employed for gaining certain proposed ends, and it carries the thoughts forward to an artist; and we infer a degree of skill, power, and good intention in this artist, proportioned to the ingenuity, extent, and happy effect which we are able to discern in his works. Such a contemplation of nature, therefore, terminates in natural theology, or the discovery of the existence and attributes of God.

Our notions of the Supreme Mind are formed from the indications of design which we observe, and which we interpret in the same way as in the actions of men. These notions, therefore, will differ from our notions of other minds only in the degrees which we are able to observe, and which we assign to these faculties; for the phenomenon or the effect is not only the mark, but also the measure, of its supposed cause. These degrees must be ascertained by our own capacity of appreciating the extent, the multiplicity, and the variety of the contrivance. Accordingly, the attributes of the Supreme Mind, in the theological creed of a rude Indian, are much more limited than in that of an European philosopher. In proportion as our understandings are enlarged, and as our acquaintance with the operations of nature around us is extended, we shall perceive higher degrees of power, of skill, and of kind intention: and since we find that the scene of observation is unbounded, we cannot affix any boundaries to these attributes in our own imagination, and we are ready to suppose that they are infinite or unbounded in their own nature. When our attentive survey of this universe, and a careful comparison of all its parts, as far as we can understand or appreciate them, have made us conclude that it is one design, the work of one artist; we are under the necessity of inferring, that, with respect to this universe, his power, wisdom, and benevolence, are indeed infinite.

When men have been led to draw this conclusion from the appearances of fitness which are observed every where around them, they consider that constancy which they observe in natural operations, whether in the material or the intellectual system, and that expectation of, and confidence in, this constancy, which renders the universe a source of enjoyment to its sentient inhabitants, as the consequences of laws imposed by the Almighty artist on his works, in the same manner as they would consider the constancy in the conduct of any people as the consequences of laws promulgated and enforced by the supreme magistrate.

There can be no doubt of this view of nature being extremely captivating, and likely to engage the curiosity of speculative men; and it is not surprising that the phenomena of mind have been keenly studied in all ages.

The occupations, however, of ordinary life have oftener directed our efforts towards material objects, and engaged our attention on their properties and relations; and as all sciences have arisen from arts, and were originally implied in the maxims and precepts of those arts, till separated from them by the curious speculatist, the knowledge of the material system of nature was possessed in de-

tached scraps by the practitioners in the various arts of life long before the natural philosopher thought of collecting them into a body of scientific doctrines. But there have not been wanting in all ages men of curiosity who have been struck by the uniformity of the operations of nature in the material world, and were eager to discover their causes.

Accordingly, while the moralists and metaphysicians turned their whole attention to the phenomena of mind, and have produced the sciences of pneumatology, logic, ethics, jurisprudence, and natural theology, these observers of nature have found sufficient employment in considering the phenomena of the material world.

The bodies of, which it consists are evidently connected by means of those properties by which we observe that they produce changes in each other's situation. This assemblage of objects may therefore be justly called a system. We may call it the material system. It is frequently termed nature; and the terms natural appearances, natural causes, natural laws, have been generally restricted to those which take place in the material system. This restriction, however, is improper, because there is no difference in the manner in which we form our notions of those laws, and reason from them, both with respect to mind and body. Or if there is to be any restriction, and if any part of the study of the universe is to be excluded in the application of these terms, it is that part only which considers moral obligation, and rather treats of what ought to be than of what is. As has been already observed, there is a considerable difference in the language which must be employed; but still there is none in the principles of investigation. We have no proof of the extent of any moral law but an appeal to the feelings of the hearts of men, indicated by the general laws or facts which are observed in their actions.

But this is only a question of the propriety of language. And no great inconvenience would arise from the restriction now mentioned if it were scrupulously adhered to; but unfortunately this is not always the case. Some authors use the term natural law to express every coincidence of fact; and this is certainly the proper use of the term. The French writers generally use the term *loi physique* in this enlarged sense. But many authors, misled by, or taking advantage of, the ambiguity of language, after having established a law founded on a copious and perhaps unexpected induction of the phenomena of the material system (in which case it must be considered in its restricted sense), have, in their explanation of phenomena, extended their principle much farther than the induction on which they had founded the existence of the physical law. They have extended it to the phenomena of mind, and have led their followers into great and dangerous mistakes. Languages, like every other production of human skill, are imperfect. They are deficient in terms, and therefore figurative. The most obvious, the most frequent and the most interesting uses of language, have always produced the appropriate terms, and the progress of cultivation has never completely supplied new ones. There are certain analogies or resemblances, or certain associations of ideas, so plain, that a term appropriated to one very familiar object will serve to suggest another analogous to it, when aided by the concomitant circumstances of the discourse; and this with sufficient precision for the ordinary purposes of social communication, and without leading us into any considerable mistakes; and it is

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only the rare and refined disquisitions of the curious speculatist that bring the poverty and imperfection of language into view, and make us wish for words as numerous as our thoughts. There is hardly a sentence even of common discourse, in which there are not several figures either of single words or of phrases; and when very accurate discrimination is required, it is almost impossible to find words or phrases to express distinctions which we clearly feel. We believe it impossible to express, by the scanty vocabulary of the Hebrews, the nice distinctions of thought which are now familiar to the European philosopher. In nothing does this imperfection of language appear so remarkably as in what relates to mind. Being a late subject of separate discussion, and interesting only to a few speculatists, we have no appropriated vocabulary for it; and all our disquisitions concerning its operations are in continual metaphor or figure, depending on very slight analogies or resemblances to the phenomena of the material world. This makes the utmost caution necessary; and it justifies the British philosophers, who have been the most successful in prosecuting the study of the intellectual system, for having, almost without exception, restricted the terms natural laws, natural causes, natural philosophy, and such like, to the material system. With us pneumatology makes no part of physics. And we may venture to affirm, that the sciences have fared better by the restriction of the terms. In no country has the spirit of liberal discussion been more encouraged and indulged than in Britain; and her philosophers have been equally eminent in both branches of science. Their performances in ethics, jurisprudence, and natural theology, are considered by all our neighbours as the fountains of knowledge on these subjects; and Locke and Clarke are names no less familiar on the continent than Newton. The licentious and degrading doctrines of the Gallican schools have as yet made little impression here; and man is still considered among us as a glorious creature, born to, and fitted for, the noblest prospects.

Physics, then, is with us the study of the material system, including both natural history and philosophy. The term is not indeed very familiar in our language; and in place of *physicus* and *disciplina physica*, we more generally use the terms naturalist and natural knowledge. The term natural philosophy, in its common acceptance, is of less extent. The field of physical investigation is still of prodigious extent; and its different quarters require very different treatments, make very different returns, and accordingly have engaged in their particular cultivation persons of very different talents and tastes. It is of some importance to perceive the distinctions, and to see how the wants and propensities of men have led them into the different paths of investigation; for, as has been more than once observed, all sciences have sprung from the humble arts of life, and both go on improving by means of a close and constant correspondence.

All the phenomena of the material system may be arranged into two classes, distinguished both by their objects and by the proper manner of treating them.

The first class comprehends all the appearances which are exhibited in the sensible motions of bodies, and their actions on each other producing sensible motion.

The second class comprehends the appearances which are exhibited in the insensible motions

and actions of the invisible particles of matter.

Of the phenomena of the first class we have examples in the planetary motions, the motions of heavy bodies, the phenomena of impulse, the motions and actions of machines, the pressure and motions of fluids, the sensible actions of magnetical and electrical bodies, and the motions of light.

We have examples of the second class in the phenomena of heat and mixture, and those exhibited in the growth of animals and vegetables, and many phenomena of solid, fluid, magnetical, electrical, and luminous bodies, in which no change of place can be observed.

Thus it appears that there is a distinction in the phenomena sufficiently great to warrant a division of the study, and to make us expect a more rapid improvement by this division. Nay, the division has been made by nature herself, in the acquaintance which men have attained with her operations without study, before science appeared, and while art constituted all our knowledge.

In both classes of phenomena already distinguished we must grant, that the principle which connects the pairs of concomitant events, rendering the one the inseparable companion of the other, is totally unknown to us, because it is not the immediate object of our perception.

But in the phenomena of the first class, we see the immediate exertion of this principle, whatever it may be; we can observe the exertion with accuracy; we can determine its kind and degree, which are the signs and measures of the kind and degree of the unperceived cause. This exertion, being always some modification of motion, allows us to call in the aid of mathematical knowledge, and thus to ascertain with the precision peculiar to that science the energy of the cause, judging of the tendency and quantity by the tendency and the quantity of the observed effect.

But in the second class of phenomena the case is very different. In the operations of chemistry, for instance, the immediate exertion of the cause is not perceived: all that we observe is the assemblage of particles which obtains before mixture, and that which takes place when it is completed, and which we consider as its result. The procedure of nature in producing the change is unseen and unknown. The steps are hid from our observation. We are not only ignorant of the cause which determines one particle of our food to become a part of our body, while others are rejected, but we do not see the operation. We are not only ignorant of the cause which determines a particle of vitriolic acid to quit the fossil alkali with which it is united in Glauber salt, and to attach itself to a particle of magnesia already united with the muriatic acid, which also quits it to unite with the alkali, but we do not see the operation. The particles and their motions are not the objects of our senses; and all that we see is the Epsom salt and common salt separate from the water in which we had formerly dissolved the sal mirabile and the muriated magnesia. The motions, which are the immediate effects of the changing causes, and therefore their only indications, characteristics, and measures, fitted to show their nature, are hid from our view.

Our knowledge therefore of these phenomena must be less perfect than that of the phenomena of the former class; and we must here content ourselves with the discovery of more remote relations and remote causes, and with our ignorance

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of the very powers of nature by which these changes are brought about, and which are cognoscible only by their immediate effects, viz. the motions which they produce unseen. The knowledge which we do really acquire is somewhat similar to what the mechanical philosopher has acquired when he has discovered, by many experiments and investigations, that magnets attract each other by their dissimilar poles, and repel each other by their similar poles, and do not act at all on any bodies but loadstones and iron. Here we leave undiscovered all that is most curious in the phenomenon, viz. how these attractions and repulsions are produced; and even here the magnetical philosopher has the advantage of seeing the agents and the operation.

But philosophers attending to this circumstance, that, even in these cases, the changes are produced by motions, or consist in motions, however unperceived these may be, have concluded, that the laws according to which nature operates in producing these changes are similar to the laws which regulate her operations in the sensible actions of bodies, or are included in them; and that the motions, though unseen, and the moving forces, are perfectly similar. They have therefore employed similar modes of investigation, applying the laws of impulse, and calling in the aid of mathematical knowledge.

Of this we have many examples in the writings of Dr. Freind, Keil, Bernoulli, Helsham, Boerhaave, Hartley, and others, who have delivered theories of fermentation, solution, precipitation, crystallization, nutrition, secretion, muscular action, nay even of sensation and intelligence, founded, as they think, on the laws of motion, and illustrated and supported by mathematical reasoning. Lord Bacon himself, that careful and sagacious distinguisher of intellectual operations, has gone into the same track in his explanation of the phenomena of fire and combustion; and sir Isaac Newton has made several attempts of the same kind, although with peculiarities which always characterise his discussions, and make them very different from those of an inferior class.

But the success of these philosophers has hitherto been very discouraging: indeed they had no title to expect any; for their whole trains of reasoning have proceeded on analogies which were not observed, but assumed or supposed without any authority. There is not that similarity in the phenomenon, or in the visible effect, which is absolutely necessary for a successful reasoning by analogy. We do not observe any local motion, any change of place, which alone enables us to reason mathematically on the subject. And to make the case desperate, this ill-founded analogy has been mixed with hypotheses completely gratuitous. Certain forms have been assigned to the particles, and certain modes of action have been laid down from them, for whose reality we have not the least argument or indication: and to complete the matter, these fancied forms and laws of action have been such as are either self-contradictory and inconsistent, or they have been such as, if allowed to act in a way analogous to what we observe in the sensible motions of bodies, would produce effects totally different from those which are observed. These atomical theories, as they are called, transgress every rule of philosophical discussion, and even the best of them are little better than trifling amusements. By far the greatest part of them only serve to raise a smile of pity and contempt in every person at all acquainted

with mechanical philosophy. Whenever we see an author attempting to explain these hidden operations of nature by invisible fluids, by æthers, by collisions, and vibrations, and particularly if we see him introducing mathematical reasonings into such explanations—the best thing we can do is to shut the book, and take to some other subject. That we may not be thought to speak presumptuously on this occasion, we only beg leave to remind our readers, that the united knowledge of the most eminent mathematicians of Europe has not yet been able to give any thing more than an approximation to the solution of the problem of three bodies; that is, to determine with accuracy the motions of three particles of matter acting on each other in the simplest of all possible manners, viz. by forces varying as the squares of the distances inversely: and the vibrations of elastic bodies, of any but the very simplest possible forms, are to this day beyond the reach of investigation. What then should be our expectations in cases where millions of particles are acting at once, of forms unobserved, and with forces unknown, and where the object is not a determination of an average result of many, where the precise state of an individual particle need not be known, but where it is this very precise state of each single particle that we want to know? What can it be but uncertainty and mistake?

Notwithstanding these discouraging circumstances, we must observe that this kind of enquiry has greatly improved of late years, along with the improvement and extension of mathematical philosophy, and since philosophers have given over their incessant attempts to explain every thing by impulse; and we need not despair of making still farther advances, if we will content ourselves with going no farther than Newton has done in his explanation of the planetary motions. He has immortalized his own name, and has added immensely to our stock of useful knowledge; yet he has stopped short at the discovery of the fact of universal gravitation; and all who have endeavoured to explain or account for this fact have only exposed themselves to pity. We may perhaps be one day able to demonstrate from the phenomena that the particles of matter have certain mutual tendencies to or from each other, exerted according to fixed or invaried rules; and from these tendencies we may be able to explain many other phenomena, and predict the consequences, with as much certainty and evidence as an astronomer calculates a future eclipse. This would be a great acquisition, and perhaps more is impossible: and the road to this has been hinted by sir Isaac Newton, who has expressed his suspicion, that as the great movements of the solar system are regulated by universal gravitation, so the mutual actions of the particles of matter are produced and regulated by tendencies of a similar kind, equally but not more inexplicable, and of which the laws of action are to be discovered by as careful an attention to the phenomena, and by the same patient thinking, which he has employed on the planetary motions.

But we have many steps to make before we begin this study: nature opens to us an immense volume; and we doubt not that our posterity will long find employment in the perusal, even though advancing with the eagerness and success of the last century. We have not yet arrived at the threshold in many parts of this research: in many parts of chemistry, for instance, we are as yet uncertain with respect to the phenomena themselves,

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which are to be the subjects of this discussion. The composition of bodies must be fully understood before we begin to speak of the forces which unite their particles, or speculate about their modes of action. So long as water was considered as an element, we were ignorant of the forces inherent in its particles; we are perhaps still ignorant of this; but we now know that they are extremely different from what we formerly supposed them to be. It is but in a very few, if in any, cases of chemical combination, that we even know what are the ingredients: till we know this, it is too soon to speculate about their mode of union. Our ignorance of the real events in the animal and vegetable economy is still greater. Our first task therefore is to proceed, as we are now doing, in the accurate examination and classification of the phenomena themselves; and, without attempting to bring them within the pale of mathematical philosophy, by attempting what are called mechanical explanations, let us give up the consideration of these hidden operations, and augment to the utmost our list of secondary laws of visible but remote connections. All the mechanical speculations of the honourable Robert Boyle about the sensible qualities of things are now forgotten; but his chemical experiments preserve all their value, and are frequently referred to. The same may be said of the sagacious Dr. Hales, whose fanciful notions of internal conflicts, and collisions, and vibrations, derogate nothing from the value of the curious facts which he has established both in the animal and vegetable economy.

This distinction in the nature of the phenomena, and this difference in the nature of the knowledge which is to be acquired, and the means which are to be employed for the successful prosecution of these two branches of general physics, has occasioned a still farther restriction (at least in Britain) of the term natural philosophy. It is particularly applied to the study of the phenomena of the first class, while those of the second have produced the sciences of chemistry and physiology.

Natural philosophy and chemistry have generally been made particular institutions in our seminaries of learning, but physiology has more commonly been taught in conjunction with anatomy, medicine and botany.

The phenomena of the first class have been usually called mechanical, in order to distinguish them from those observed in the operations of chemistry, and in the animal and vegetable economy; and the explanations which have been attempted of some of the last, by applying the laws observed in the phenomena of the first class, have been called mechanical explanations.

As this first class is evidently but a part of general physics, there is some impropriety in giving the name natural philosophy to a course of doctrines which is confined to these alone. Indeed at the first institution of universities, the lectures given in the Schola Physica were much more extensive, comprehending almost all the phenomena of the material world: but as all arts and sciences have improved most where the labour has been most divided, it was found more conducive to the advancement of knowledge that separate institutions should be founded for the studies of natural history, chemistry, physiology, &c.; and thus the phenomena, purely mechanical, and a few others in magnetism, electricity, and optics, which either were susceptible of mathematical treatment, or had little connection with the studies of chemistry and physiology, were

left to the care of the professor of natural philosophy.

As the terms chemistry and physiology have been applied to two very important branches of general physics, we think that a more specific or characteristic name might be appropriated to the other, and that it might very properly be termed mechanical philosophy.

It only remains to make a few observations on the distinctive means of prosecuting these studies with success, and to point out some of the advantages which may reasonably be expected from a careful prosecution of them: and as the second branch has been fully treated under the several articles of CHEMISTRY, PHYSIOLOGY, &c. we shall confine ourselves to what is usually called natural philosophy.

Mechanical philosophy may, in conformity with the foregoing observations, be defined, "the study of the sensible motions of the bodies of the universe, and of their actions producing sensible motions, with a view to discover their causes, to explain subordinate phenomena, and to improve art."

The principle upon which all philosophical discussion proceeds is, that every change which we observe in the condition of things is considered by us as an effect, indicating the agency, characterising the kind, and measuring the degree of its cause.

In the language of mechanical philosophy, the cause of any change of motion is called a moving or changing force.

The disquisitions of natural philosophy must therefore begin with the consideration of motion, carefully noticing every affection or quality of it, so as to establish marks and measures of every change of which it is susceptible; for these are the only marks and measures of the changing forces. This being done, it only remains to apply them to the motions which we observe in the universe.

From the general principle of philosophical discussion already mentioned, there flow directly two axioms.

1. Every body perseveres in a state of rest or of uniform rectilinear motion, unless affected by some moving force.

2. Every change of motion is in the direction and in the degree of the force impressed.

These are usually called the laws of motion. They are more properly laws of human judgment, with respect to motion. Perhaps they are necessary truths, unless it be alleged that the general principle, of which they are necessary consequences, is itself a contingent though universal truth.

By these two axioms, applied *in abstracto* to every variety of motion, we establish a system of general doctrines concerning motions, according as they are simple or compounded, accelerated, retarded, rectilinear, curvilinear, in single bodies; or in systems of connected bodies; and we obtain corresponding characteristics and measures of accelerating or retarding forces, centripetal or centrifugal, simple or compound.

We have an illustrious example of this abstract system of motion and moving forces in the first book of sir Isaac Newton's Mathematical Principles of Natural Philosophy. Euler's *Mechanica sive Scientia Motus*, Herman's *Phoronomia sive de Veribus Corporum*, and D'Alembert's *Traité de Dynamique*, are also excellent works of the same kind. In this abstract system no regard

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is paid to the casual differences of moving forces, or the sources from which they arise. It is enough to characterise a double accelerating force, for instance, that it produces a double acceleration: It may be a weight, a stream of water, the pressure of a man; and the force, of which it is said to be double, may be the attraction of a magnet, a current of air, or the action of a spring.

Having established these general doctrines, the philosopher now applies them to the general phenomena of the universe, in order to discover the nature of the forces which really exist, and the laws by which their operations are regulated, and to explain interesting but subordinate phenomena. This is the chief business of the mechanical philosopher; and it may with some propriety be called the mechanical history of nature.

Some method must be followed in this history of mechanical nature. The phenomena must be classed by means of their resemblances, which infer a resemblance in their causes, and these classes must be arranged according to some principle. We have seen no method which appears to us less exceptionable than the following.

The principle of arrangement is the generality of the phenomena; and the propriety of adopting this principle arises from the probability which it gives us of more readily discovering the most general actuating forces, whose agency is implicated in all other phenomena of less extent; and therefore should be previously discussed, that we may detect the discriminating circumstances which serve to characterise the subordinate phenomena, and are thus the marks of the distinguishing and inferior natural powers.

The most general of all phenomena is the curvilinear motion of bodies in free space; it is observed through the whole extent of the solar system.

The mechanical history of nature begins therefore with astronomy. Here, from the general phenomena of the planetary motions, is evinced the fact of the mutual deflection of every body towards every other body, and this in the inverse proportion of the squares of the distance, and the direct proportion of the quantity of matter. This is the fact of universal gravitation, indicating the agency, and measuring the intensity, of the universal force of mutual gravity.

Having established this as an universal fact, the natural philosopher proceeds to point out all the particular facts which are comprehended under it, and whose peculiarities characterise the different movements of the solar system. That is, in the language of philosophy, he gives a theory or explanation of the subordinate phenomena; the elliptical motions of the planets and comets, their mutual disturbances; the lunar irregularities; the oblate figure of the planets; the nutation of the earth's axis; the precession of the equinoxes; and the phenomena of the tides and trade-winds; and he concludes with the theory of the parabolic motion of bodies projected on the surface of this globe, and the motion of pendulums. As he goes along, he takes notice of the applications which may be made to the arts of life of the various doctrines which are successively established; such as chronology, astronomical calculation, dialling, navigation, gunnery, and the measuring of time.

If a square parcel of sand be lying on the table,

and the finger be applied to any part of it to push it along the table, that part is removed where you will, but the rest remains in its place but if it is a piece of sand-stone of the same materials and shape, and the finger is applied as before, the whole is moved; the other parts accompany the part impelled by the finger in all its motions.

From the moon's accompanying the earth in all its motions round the sun, we infer a moving force which connects the moon and earth. In like manner, we must conclude that a moving force connects the particles of the stone; for we give the name force to every thing which produces motion; we call it the force of cohesion; a term which, like gravitation, expresses merely a fact.

This seems to be the next phenomenon of the universe in point of extent.

Having, from the general phenomenon, established the existence of this force, the philosopher proceeds to ascertain the laws by which its exertions are regulated, which is the ascertaining its distinctive nature and properties. This he does in the same way that he ascertained the nature of planetary gravitation, viz by observing more particularly the various phenomena.

Here is opened a most extensive and varied field of observation, in which it must be acknowledged that very little regular and marked progress has been made. The variety in the phenomena, and the consequent variety in the nature of the connecting forces, appear as yet inconceivably great; and there seems little probability of our being able to detect in them all any sameness, combined with the other distinguishing circumstances, as we have done in the case of gravity. Yet we should not despair. Boscovich has shown, in the most unexceptionable manner, that although we shall suppose that every atom of matter is endued with a perfectly similar force, acting in a certain determined ratio of the small and imperceptible distances at which the particles of matter are arranged with respect to each other, the external or sensible appearances may, and must, have all that variety which we observe. He also shows very distinctly, how, from the operation of this force, must arise some of the most general and important phenomena which characterise the different forms of tangible bodies.

We observe the chief varieties of the action of this corpuscular force on the bodies which we denominate hard, soft, solid, fluid, vaporous, brittle, ductile, elastic. We see instances where the parts of bodies avoid each other, and require external force to keep them together, or at certain small distances from each other. This is familiar in air, vapours, and all compressible and elastic bodies.

This is evidently a most curious and interesting subject of investigation. On the nature and action of these corpuscular forces depend the strength or firmness of solids, their elasticity, their power of communicating motion, the pressure, and motion, and impulse of fluids; nay, on the same actions depend all the chemical and physiological phenomena of expansion, fusion, congelation, vaporisation, condensation, solution, precipitation, absorption, secretion, fermentation, and animal and vegetable concoction and assimilation.

Out of this immense store of phenomena, this inexhaustible fund of employment for our

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powers of investigation, the natural philosopher selects those which lead directly to the production or modification of sensible motion.

He will therefore consider,

1. The communication of motion among detached and free bodies, establishing the laws of impulse or collision. This has always been considered as the elementary doctrine of mechanical philosophy, and as the most familiar fact observed in the material world; and in all ages philosophers have been anxious to reduce all actions of bodies on each other to impulse, and have never thought a phenomenon completely explained or accounted for till it has been shown to be a case of impulse. This it is which has given rise to the hypotheses of vortices, ethers, magnetic and electric fluids, animal spirits, and a multitude of fancied inter-mediums between the sensible masters of matter, which are said in common language to act on each other. A heavy body is supposed to fall, because it is impelled by a stream of an invisible fluid moving according to certain conditions suited to the case. The filings of iron are supposed to be arranged round a magnet, by means of a stream of magnetic fluid issuing from one pole, circulating perpetually round the magnet, and entering at the other pole, in the same manner as we observe the flote-grass arranged by the current of a brook.

But the philosopher who has begun the mechanical study of nature by the abstract doctrines of dynamics and made its first application to the celestial phenomena, and who has attended carefully to the many analogies between the phenomena of gravitation and cohesion, will be at least ready to entertain very different notions of this matter. He will be so far from thinking that the production of motion by impulse is the most familiar fact in nature, that he will acknowledge it to be comparatively very rare; nay, there are some appearances in the facts which are usually considered as instances of impulsion, which will lead him to doubt, and almost to deny, that there has ever been observed an instance of one body putting another in motion by coming into absolute contact with it, and striking it; and he will be disposed to think that the production of motion in this case is precisely similar to what we observe when we gently push one floating magnet towards another, with their similar poles fronting each other. There will be the same production of motion in the one and diminution of it in the other, and the same uniform motion of the common centre of gravity: and, in this case of the magnets, he sees completely the necessity of a law of motion, which is not an axiom, but is observed through the whole of nature, and which receives no explanation from any hypothesis of an intervening fluid, but is even totally inconsistent with them. We mean, "that every action of one body on another is accompanied by an equal and opposite action of that other on the first." This is usually called the equality of action and reaction: it is not intuitive, but it is universal; and it is a necessary consequence of the perfect similarity of the corpuscular forces of the same kinds of matter. This general fact, unaccountable on the hypothesis of impelling fluids, is considered in the planetary motions as the unequivocal indication of the sameness of that gravity which regulates them all. The rules of good reasoning should make us draw the same conclusion here, that the particles of tangible matter are connected by equal and mutual forces, which

are the immediate causes of all their sensible actions, and that these forces, like gravitation, vary with every change of distance and situation.

The laws of collision and impulsion being now established, either as original facts or as consequences of the agency of equal and mutual force which connect the particles of matter, the philosopher considers,

2. The production of motion by the intervention of solid bodies, where, by reason of the cohesion of matter, some of the motions are necessarily confined to certain determinate paths or directions. This is the case in all motions round fixed points or axes, or along planes or curves which are oblique to the action of the forces.

This part of the study contains the theory of machines, pointing out the principles on which their energy depends, and consequently furnishing maxims for their construction and improvement. But these observations do not complete the discussion of the mechanism of solid bodies: they are not only solid and inert, but they are also heavy; therefore the action of gravity must be combined with the consequences of solidity. This will lead to discussions about the centre of gravity, the theory and construction of arches and roofs, the principles of stability and equilibrium, the attitudes of animals, and many particulars of this kind.

3. The philosopher will now turn his attention to another form, in which tangible matter exhibits many interesting phenomena, viz. fluidity. The first thing to be attended to here is, What is that particular form of existence? What is the precise phenomenon which characterises fluidity? What is the definition of a fluid? This is by no means an easy question, and considerable objections may be stated against any definition that has been given of it. Sir Isaac Newton says, that a fluid is a body whose particles yield to the smallest impression, and by so yielding are easily moved among themselves. It may be doubted whether this be sufficiently precise; what is meant by the smallest impression? and what is easily moving? Is there any precise degree of impression to which they do not yield; and do they oppose any resistance to motion? And a stronger objection may be made. It is not clear that a body so constituted will exhibit all the appearances which a body acknowledged to be fluid does really exhibit. Euler offers some very plausible reasons for doubting whether it will account for the horizontal surface, and the complete propagation of pressure through the fluid in every direction; and therefore prefers selecting this last phenomenon, the propagation of pressure *quodcumque versum*, as the characteristic of fluidity, because a body having this constitution (on whatever circumstances it may depend) will have every other observed property of a fluid. But this definition is hardly simple or perspicuous enough; and we think that the objections against Newton's more simple and intelligible definition are not unanswerable. Boscovich defines a fluid to be, a body whose particles exert the same mutual forces in all directions; and shows, that such particles must be indifferent, as to any position with respect to each other. If no external force act on them, they will remain in every position, and will have no tendency to arrange themselves in one position rather than another; differing in this respect from the particles of solid,

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or soft, or viscid bodies; which require some force to change their respective positions, and which recover these positions again when but gently disturbed. He illustrates this distinction very beautifully, by comparing a parcel of balls thrown on quicksilver, and attracting each other with a parcel of magnets in the same situation. The balls will stick together, but in any position; whereas the magnets will always affect a particular arrangement.

When the characteristic phenomenon of fluidity has been selected, the philosopher proceeds to combine this property with gravity, and establishes the doctrines of hydrostatics, or of the pressure and equilibrium of heavy fluids, the propagation of this pressure in every direction; and demonstrates the horizontality of surface assumed by all perfect fluids.

These doctrines and principles enable us to determine several very interesting circumstances respecting the mutual pressure of solids and fluids on each other; the pressures exerted on the bottoms and sides of vessels; the support and whole mechanism of floating bodies, &c.

He then considers how fluids will move when their equilibrium of pressure is destroyed; and establishes the doctrines of hydraulics, containing all the modifications of this motion, arising from the form of the vessels, or from the intensity or direction of the pressure which occasions it. And this subject is completed by the consideration of the resistance which fluids oppose to the motion of solid bodies through them, and their impulse on bodies opposed to their action.

These are very important matters, being the foundations of many mechanical arts, and furnishing us with some of our most convenient and efficacious powers for impelling machines. They are also of very difficult discussion, and are by no means completely investigated or established. Much remains yet to be done both for perfecting the theories and for improving the arts which depend on them.

It is evident, that on these doctrines depend the knowledge of the motions of rivers and of waves; the buoyancy, equilibrium and stability of ships; the motion of ships through the waters; the action of the winds on the sails; and the whole arts of marine construction and seaman-ship.

There is another general form of tangible matter which exhibits very different phenomena, which are also extremely interesting; we mean that of vapour. A vapour is a fluid; and all the vapours that we know are heavy fluids: they are therefore subject to all the laws of pressure and impulse, which have been considered under the articles **HYDROSTATICS** and **HYDRAULICS**. But they are susceptible of great compression by the action of external forces, and expand again when these forces are removed. In consequence of this compression and expansion, the general phenomena of fluidity receive great and important modifications; and this class of fluids requires a particular consideration. As air is a familiar instance, this branch of mechanical philosophy has been called **PNEUMATICS**.

Under this head we consider the pressure of the atmosphere, and its effects, both on solid and fluid bodies. It produces the rise of waters or other fluids in pumps and syphons, and gives us the theory of their construction: it explains many curious phenomena of nature, such as the motions in the atmosphere, and their connection

with the pressure of the air, and its effect on the barometer or weather-glass. Air, when in motion, is called wind; and it may be employed to impel bodies. The theory of its action, and of its resistance to moving bodies, is therefore to be considered in this place.

But besides their motions of progression, &c. such as we observe in winds, compressible or elastic fluids are susceptible of what may be termed internal motion; a kind of undulation, where the contiguous parts are thrown into tremulous vibrations, in which they are alternately condensed and rarefied: and these undulations are propagated along the mass of elastic fluid, much in the same way in which we observe waves to spread on the surface of water. What makes this an interesting subject of consideration is, that these undulations are the more ordinary causes of sound. A trembling chord, or spring, or bell, agitates the air adjoining to it: these agitations are propagated along the air, and by its intervention agitate the organ of hearing. The mechanism of these undulations has been much studied, and furnishes a very beautiful theory of musical harmony.

The philosopher examines the law of compressibility of air and other elastic fluids: and thus gets the knowledge of the constitution of the atmosphere, and of the action of those fluids when employed to impel solid bodies. Gunpowder contains an immense quantity of permanently elastic air, which may be set at liberty by inflammation. When this is done at the bottom of a piece of ordnance, it will impel a ball along the barrel and discharge it from the muzzle in the same way that an arrow is impelled by a bow. And thus having discovered in what degree this air presses in proportion to its expansion, we discover its action on the ball through the whole length of the piece, and the velocity which it will finally communicate to it. Here then is contained a theory of artillery and of mines.

Chemistry teaches us, that most bodies can be converted by fire into elastic fluids, which can be employed to act on other bodies in the way of pressure or impulse. Thus they come under the review of the mechanical philosopher; and they have become interesting by being employed as moving forces in some very powerful machines.

These discussions will nearly exhaust all the general mechanical phenomena. There remain some which are much more limited, but furnish very curious and important subjects of investigation.

The phenomena exhibited between loadstones or magnets and iron have long attracted attention; and the use to which the polarity of the loadstone has been applied, namely, the directing the course of a ship through the pathless ocean, has rendered these phenomena extremely interesting. They are specified by the term magnetism. Considerable progress has been made in the arrangement and generalization of them; but we have by no means been able hitherto to bring them all under one simple fact. The attention has been too much turned to the discovery of the ultimate cause of magnetism; whereas we should have rather employed our ingenuity in discovering all the general laws, in the same manner as Kepler and Newton did with respect to the celestial phenomena, without troubling themselves with the cause of gravitation. Dr. Gilbert of Colchester was the first who considered the magnetical phenomena in the truly philosophical manner; and

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his treatise *De Magnete* may be considered as the first and one of the most perfect specimens of the Baconian or inductive logic. It is indeed an excellent performance; and when we consider its date, 1580, it is a wonder. *Æpinus's Tentamen Theoriæ Magnetismi* is a most valuable work, and contains all the knowledge which we have as yet of the subject.

There is another class of mechanical phenomena which has a considerable affinity with the magnetical; we mean the phenomena called electrical. Certain bodies, when rubbed or otherwise treated, attract and repel other bodies, and occasion a great variety of sensible motions in the neighbouring bodies. Philosophers have paid much attention to these appearances of late years, and established many general laws concerning them. But we have not been more successful in bringing them all under the fact, and thus establishing a complete theory of them, than in the case of magnetism. Franklin and *Æpinus* are the authors who have been most successful in this respect. Dr. Franklin in particular has acquired great celebrity by his most sagacious comparison of the phenomena; which has enabled him to establish a few general laws, almost as precise as those of Kepler, and of equally extensive influence. His discovery too of the identity of thunder and electricity has given an importance and dignity to the whole subject.

There are many phenomena of electricity which cannot be called mechanical, and are of the most curious and interesting kind. As these have little connection with any of the other great branches of physical science, they have generally been considered in treatises of natural philosophy; and along with inquiries into the original cause of electricity in general, continue to engage much of our attention. See **ELECTRICITY** and **VOLTAISM**.

The appearances which are presented to us by our sense of seeing form another class, which have always been considered as making a branch of natural philosophy in all seminaries of learning. It does not, however, obviously appear, that they are mechanical phenomena. The intimate nature of light is still a secret. Fortunately it is not necessary to be known to give us a very perfect theory of the chief phenomena. The general laws of optics are so few, so simple, and so precise, that our theories are perhaps more perfect here than in any other branch of physics; but these theories are as yet far removed from the rank of primary facts. Many unknown events happen before the phenomenon comes under the hands of the ordinary optician, so as to become the subjects of the simple laws of reflection and refraction. It may even be doubted, and has been doubted, whether the phenomena of optics are cases of body in motion; whether all the lines which the optician draws are any thing but the directions along which certain qualities are exerted. See **OPTICS** and **VISION**.

The questions about the activity or inactivity of matter are not physical, but metaphysical. Natural philosophy, it is true, commonly takes it for granted that matter is wholly inactive; but it is not of any moment in physics whether this opinion is true or false; whether matter is acted on according to certain laws, or whether it acts of itself according to the same laws, makes no difference to the natural philosopher. It is his business to discover the laws which really obtain, and to apply these to the solution of subordinate

phenomena: but whether these laws arise from the nature of some agent external to matter, or whether matter itself is the agent, are questions which may be above his comprehension, and do not immediately concern his proper business.

We shall conclude this disquisition by remarking that there is no class of men to whom this science is of more service than to those who hold the honourable office of teachers of religion. Their knowledge in their own science, and their public utility, are prodigiously hurt by ignorance of the general frame and constitution of nature; and it is much to be lamented that this science is so generally neglected by them, or considered only as an elegant accomplishment: nay, it is too frequently shunned as a dangerous attainment, as likely to unhinge their own faith, and taint the minds of their hearers. We hope, however, that few are either so feebly rooted in the belief of the great doctrines of religion as to fear this, or of minds so base and corrupted as to adopt and inculcate a belief which they have any suspicion of being ill-founded. But many have a sort of horror at all attempts to account for the events of nature by the intervention of general causes, and think this procedure derogatory to the Divine nature, and inconsistent with the doctrine of his particular providence; believing, that "a sparrow does not fall to the ground without the knowledge of our heavenly Father." Their limited conceptions cannot perceive, that, in forming the general law, the Great Artist did at one glance see it in its remotest and most minute consequence, and adjust the vast assemblage so as completely to answer every purpose of His providence. There never was a more eager inquirer into the laws of nature, or more ardent admirer of its glorious Author, than the hon. Robert Boyle. This gentleman says, that he will always think more highly of the skill and power of that artist who should construct a machine, which, being once set a-going, would of itself continue its motion for ages, and from its inherent principles continue to answer all the purposes for which it was first contrived, than of him whose machine required the continual aid of the hand which first constructed it. It is owing to great inattention that this aversion to the operation of secondary causes has any influence on our mind. What do we mean by the introduction of secondary causes? How do we infer the agency of any cause whatever? Would we ever have supposed any cause of the operations of nature, had they gone on without any order or regularity? Or would such a chaos of events, any more than a chaos of existences, have given us any notion of a forming and directing hand? No surely. We see the hand of God in the regular and unvaried course of nature, only because it is regular and unvaried. The philosopher expresses this by saying, that the phenomena proceed by unalterable laws. Greatly mistaken, therefore, are they who think that we supersede the existence of mind and of providence when we trace things to their causes. A physical law, being an unvaried fact, is an indication, and the strongest possible indication, of an unerring mind, who is incapable of change, and must do to-day what He always did: for to change is to deviate from what is best. The operations of unerring mind will therefore be regular and invariable. Physical laws, therefore, or secondary causes, are the best proofs of unerring wisdom. Such regularity of conduct is universally considered as indications of wisdom

among men. The wise man is known by the constancy of his conduct, while no man can depend on the future conduct of a fool.

And what astonishing evidences of wisdom do we not observe in the general laws of the material world! They will ever be considered by the intelligent philosopher as the most glorious display of inconceivable wisdom, which has been able, by means so few and so simple, to produce effects which by their grandeur astonish our feeble understandings, and by their inexhaustible variety elude all possibility of enumeration.

While the teachers of religion remain ignorant of the beautiful laws of nature, the great characteristics of the wisdom and goodness of the Almighty Creator, their hearers are deprived of much sublime pleasure; God is robbed of that kind of praise which he would have received from an enlightened people; and the worship he receives, however sincere, may be tainted with mean notions of his attributes, if it be accompanied by any notions at all.

PHYSIOGNOMER. PHYSIOGNOMIST.
s. (from *physiognomy*.) One who judges of the temper or future fortune by the features of the face (*Peacham. Dryden*).

PHYSIOGNOMIC. PHYSIOGNOMONIC.
a. (*φυσιογνωμονικός*.) Drawn from the contemplation of the face; conversant in contemplation of the face.

PHYSIOGNOMY. (*physiognomia*, *φυσιογνωμία*; from *φύσις*, nature, and *γινωσκω*, to know.) "The science by which the dispositions of mankind are discoverable by the features of the body, and especially by those of the countenance." Aristotle, who first employed this term, and professedly treated of the subject it indicates, has given this definition of the study. His leading principle in treating of it was the following: a peculiar form of body is invariably accompanied by a peculiar disposition of mind: a human intellect is never found in the corporeal form of a beast; and the mind and body exercise a reciprocal affection over each other: thus in intoxication and mania, the mind exhibits the affections of the body; and in fear, in joy, &c. the body inversely displays the affections of the mind.

From such facts he argues, that when in man a particular bodily character appears, which by prior experience and observation has been found uniformly accompanied by a certain mental disposition, with which therefore it must have been necessarily connected; we are entitled in all such cases to infer the disposition from the appearance. Our observations, he conceives, may be drawn from other animals as well as from men: for, as a lion possesses one bodily form and mental character, a hare another, the corporeal characteristics of the lion, such as strong hair, deep voice, large extremities, discernible in a human creature, denote the strength and courage of that noble animal; while the slender extremities, soft down, and other features of the hare, visible in a man, betray the mental character of that pusillanimous creature.

Upon this principle Aristotle treats of the corporeal features of man; and the correspondent dispositions, so far as observed: he illus-

trates them by the analogy just mentioned, and in some instances he attempts to account for them by physiological reasoning.

At the early period in which Aristotle wrote, his theory, plausible certainly, and even probable, displays his usual penetration, and a considerable degree of knowledge. He distinctly notices individual physiognomy, national physiognomy, and comparative physiognomy. The state of knowledge in his time did not admit of a complete elucidation of his general principles; on that account his enumeration of particular observations and precepts is by no means so well founded or so accurate as his method of study. Even his style, concise and energetic, was inimical to the subject; which, to be made clearly comprehensible, must require frequent paraphrases. Aristotle's performance, however, such as it is, has been taken as the groundwork and model of every physiognomical treatise that has since appeared.

The imitators of this great man in the 16th and 17th centuries have even copied his language and manner, which are sententious, indiscriminate, and obscure. His comparative physiognomy of men with beasts has been frequently though not universally adopted. Besides his treatise expressly on the subject, many incidental observations on physiognomy will be found interspersed through his other works, particularly in his history of animals.

Next after Aristotle, his disciple and successor Theophrastus deserves to be particularly mentioned as a writer on the subject in question. His ethic characters, a singular and entertaining performance, composed at the age of 99, form a distinct treatise on a most important branch of physiognomy, the physiognomy of manners: but the translations and imitations of La Bruyere are so excellent, that by referring to them we do greater justice than would otherwise be in our power, both to Theophrastus and to our readers. We cannot, however, omit observing, that the accuracy of observation and liveliness of description displayed in the work of Theophrastus will preserve it high in classical rank, while the science of man, and the prominent characteristics of human society, continue to be objects of attention.

Polemon of Athens, Adamantius the sophist, and several others, wrote on the subject about the same period. Lately there has been published a collection of all the Greek authors on physiognomy; the book is entitled, *Physiognomiaz veteris Scriptores Græci. Gr. et Lat. a Franzio Altenb. 1780, 8vo.* From the number of these authors, it appears that the science was much cultivated in Greece; but the professors seem soon to have connected with it something of the marvellous, and especially with the art of divination.

From this period to the close of the Roman republic, nothing worthy of remark occurs in the literary history of physiognomy. About the last-mentioned era, however, and from thence to the decline of the empire under the later emperors, the science appears to have been

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cultivated as an important branch of erudition, and assumed as a profession by persons who had acquired a superior knowledge in it.

In the works of Hippocrates and Galen, many physiognomical observations occur. Cicero appears to have been peculiarly attached to the science. In his oration against Piso, and in that in favour of Roscius, the reader will at the same time perceive in what manner the orator employs physiognomy to his purposes, and find a curious instance of the ancient manner of oratorical abuse.

Many physiognomical remarks are to be found likewise in the writings of Sallust, Suetonius, Seneca, Pliny, Aulus Gellius, Petronius, Plutarch, and others.

That in the Roman empire the science was practised as a profession, ample evidence appears in the writings of several of the authors just mentioned. Suetonius, for instance, in his life of Titus, mentions that Narcissus employed a physiognomist to examine the features of Britannicus, who predicted that Britannicus would not succeed, but that the empire would devolve on Titus.

The science of physiognomy shared the same fate with all others, when the Roman empire was overthrown by the northern barbarians. About the beginning of the sixteenth century it began again to be noticed. From that time till the close of the seventeenth, it was one of the most fashionable studies. Within that space have appeared almost all the approved modern authors on the subject. See the Polyhistor of Morhoff. I. i. 15; and II. iii. 1.

It is unfortunate for physiognomy, that by many of these writers it has been held to be connected with doctrines of which the philosophy of the present day would be ashamed. With these doctrines it had at one time almost sunk into oblivion.

In every period of the history of literature there may easily be marked a prevalence of particular studies. In the early period, for instance, of Grecian literature, mythological morality claimed the chief attention of the philosophers. In the more advanced state of learning in Greece and in Rome, poetry, history, and oratory, held the pre-eminence. Under the later emperors, and for some time afterwards, the history of theological controversies occupied the greatest part of the works of the learned. Next succeeded metaphysics, and metaphysical theology. These gave place to alchemy, magic, judicial astrology, the doctrine of signatures and sympathies, the mystic, theosophic, and Rosicrucian theology, with physiognomy. Such were the pursuits contemporary with the science which is the object of our present inquiry. It is no matter of surprise, that, so associated, it should have fallen into contempt. It is not unusual for mankind hastily to reject valuable opinions, when accidentally or artificially connected with others which are absurd and untenable. Of the truth of this remark, the history of theology, and the present tone of theological opinions in Europe, furnish a pregnant example.

To physiognomy, and the exploded sciences last mentioned, succeeded classic philology; which gave place to modern poetry and natural philosophy; to which recently have been added the studies of rational theology, chemistry, the philosophy of history, the history of man, and the science of politics.

About the commencement of the eighteenth century, and thence forward, the occult sciences, as they are termed, had declined very considerably in the estimation of the learned; and those who treated of physiognomy forbore to disgrace it by a connection with those branches of ideal learning with which formerly it had been invariably conjoined. In Britain, Dr. Gwyther noticed it with approbation. His remarks are published in the Philosophical Transactions, vol. xviii. and Dr. Parsons chose it for the subject of the Croonian lectures, published at first in the second supplement to the 44th volume of the Philosophical Transactions, and afterwards (1747) in a separate treatise, entitled Human Physiognomy explained.

The observations, however, of these writers, as well as of Lancisius, Haller, and Buffon, relate rather to the transient expression of the passions than to the permanent features of the face and body. The well-known characters of Le Brun likewise are illustrative of the transient physiognomy, or (as it is termed) pathognomy. See PASSIONS in PAINTING.

During the present century, although physiognomy has been now and then attended to, nothing of importance appeared on the subject till the discussion between Pernetty and Le Cat, in the Berlin Transactions. Their essays are employed in discussing the following questions: 1. Whether it would or would not be advantageous to society, were the character, disposition, and abilities, of each individual so marked in his appearance as to be discovered with certainty?

2. Whether, on the supposition that by the highest possible proficiency in physiognomy we could attain a knowledge in part only of the internal character, it would be advantageous to society to cultivate the study, mankind being in general imperfect physiognomists?

No reasoning *a priori* can possibly determine these questions. Time and experience alone must ascertain the degree of influence which any particular acquisition of knowledge would have on the manners and characters of mankind; but it is difficult to conceive how the result of any portion of knowledge, formerly unknown, and which mankind would be permitted to discover, could be any thing but beneficial.

Soon after this controversy in the Berlin Transactions, appeared the great work of M. Lavater, dean of Zurich, which has excited no inconsiderable portion of attention in the literary world. The work itself is magnificent: that circumstance, as well as the nature of the subject which was supposed to be fanciful, have contributed to extend its fame; and certainly, if we may judge, the book, though many faults may be detected in it, is the most important of

any that has appeared on the subject since the days of Aristotle. Lavater professes not to give a complete synthetical treatise on physiognomy, but, aware that the science is yet in its infancy, he exhibits fragments only illustrative of its different parts. His performance is no doubt desultory and unconnected. It contains, however, many particulars much superior to any thing that had ever before appeared on the subject.

With the scholastic and systematic method adopted by the physiognomists of the last and preceding centuries, Lavater has rejected their manner of writing, which was dry, concise, indeterminate, and general: his remarks, on the contrary, are for the most part precise and particular, frequently founded on distinctions extremely acute. He has omitted entirely (as was to be expected from a writer of the present day) the astrological reveries, which deform the writings of former physiognomists; and he has with much propriety deduced his physiological observations but seldom from anatomical or physiological reasoning. Such reasoning may perhaps at some future period become important; but at present our knowledge of facts, although extensive, is not so universal as to lay a stable foundation for particular deductions. Lavater has illustrated his remarks by engravings; a method first adopted by Baptista Porta. Lavater's engravings are very numerous, often expressive, and tolerably executed.

The opinions of this celebrated physiognomist are evidently the result of actual observation. He appears indeed to have made the science his peculiar study, and the grand pursuit of his life. His performance exhibits an extended comprehension of the subject, by a particular attention to osseal physiognomy, and the effect of profiles and contours. His style in general is forcible and lively, although somewhat declamatory and digressive. His expressions are frequently precise, and strikingly characteristic; and the spirit of piety and benevolence which prevades the whole performance renders it highly interesting.

The defects of the work, however, detract much from the weight which Lavater's opinions might otherwise challenge. His imagination has frequently so far outstript his judgment, that an ordinary reader would often be apt to reject the whole system as the extravagant reverie of an ingenious theorist. He has clothed his favourite science in that affected mysterious air of importance which was so usual with his predecessors, and describes the whole material world to be objects of the universal dominion of physiognomy. He whimsically conceives it necessary for a physiognomist to be a well-shaped handsome man. He employs a language which is often much too peremptory and decisive, disproportioned to the real substance of his remarks, or to the occasion of making them. The remarks themselves are frequently opposite in appearance to common observation, and yet unsupported by any illustrations of his.

Lavater certainly errs in bestowing too great a reliance on single features, as the foundation of decision on character. His opinions on the physiognomy of the ears, hands, nails, and feet, of the human species, on hand-writing, on the physiognomy of birds, insects, reptiles, and fishes, are obviously premature, as hitherto no sufficient number of accurate observations have been made, in regard to either of these particulars, to authorise any conclusion. He has erred in the opposite extreme, when treating of the important topic of national physiognomy, where he has by no means prosecuted the subject so far as facts might have warranted. We must farther take the liberty to object to the frequent introduction of the author's own physiognomy throughout the course of his work. His singular remarks on his own face do not serve to prejudice the reader in favour of his judgment, how much soever his character may justify the truth of them. We must regret likewise, for the credit of the science, that the author's singularly fanciful theory of apparitions should so nearly resemble a revival of the antiquated opinions of the sympathists.

To these blemishes, which we have reluctantly enumerated, perhaps may be added that high impassioned tone of enthusiasm in favour of his science every where displayed throughout the work of this author, which is certainly very opposite to the cool patient investigation befitting philosophy. To that enthusiasm, however, it is probable that in this instance (as is, indeed, no unrequent effect of enthusiasm) we are indebted for the excellency which the author has attained in his pursuit; and it possesses the salutary tendency of putting us on our guard against a too implicit acquiescence in his physiognomical decisions.

In the Berlin Transactions for 1775, there appears a formal attack upon Lavater's work by M. Formey. After disputing the propriety of the extensive signification applied by Lavater and Pernetty to the term physiognomy, M. Formey adopts nearly the definition which we conceive to be the most proper. He allows that the mental character is intimately connected with, and sensibly influenced by, every fibre of the body; but his principal argument against physiognomy is, that the human frame is liable to innumerable accidents, by which it may be changed in its external appearance, without any correspondent change of the disposition; so that it surpasses the extent of the skill of mortals to distinguish the modifications of feature that are natural from those which may be accidental. Although, therefore, the science of physiognomy may be founded in truth, he infers that the Deity only can exercise it.

M. Formey further contends, that education, diet, climate, and sudden emotions, nay even the temperaments of ancestors, affect the cast of human features; so that the influence of mental character on these features may be so involved with, or hidden by, accidental circumstances, that the study of physiognomy must ever be attended by hopeless uncertainty.

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These objections are worthy of notice, but they are by no means conclusive.

We shall give a specimen of M. Lavater's manner of treating the subject on the opposite side of the question: a specimen not in Lavater's precise words, but conveying more shortly an idea at once of his sentiments, and of his manner of expressing them.

No study, says he, excepting mathematics, more justly deserves to be termed a science than physiognomy. It is a department of physics, including theology and belles lettres, and in the same manner with these sciences may be reduced to rule. It may acquire a fixed and appropriate character; it may be communicated and taught.

Truth or knowledge, explained by fixed principles, becomes science: Words, lines, rules, definitions, are the medium of communication. The question, then, with respect to physiognomy will thus be fairly stated. Can the striking and marked differences which are visible between one human face, one human form, and another, be explained, not by obscure and confused conceptions, but by certain characters, signs, and expressions? Are these signs capable of communicating the vigour or imbecility, the sickness or health, of the body; the wisdom, the folly, the magnanimity, the meanness, the virtue, or the vice, of the mind?

It is only to a certain extent that even the experimental philosopher can pursue his researches. The active and vigorous mind, employed in such studies, will often form conceptions which he shall be incapable of expressing in words, so as to communicate his ideas to the feebler mind, which was itself unable to make the discovery: but the lofty, the exalted mind, which soars beyond all written rule, which possesses feelings and energies reducible to no law, must be pronounced unscientific.

It will be admitted, then, that to a certain degree physiognomical truth may as a science be defined and communicated. Of the truth of the science there cannot exist a doubt. Every countenance, every form, every created existence, is individually distinct, as well as different, in respect of class, race, and kind. No one being in nature is precisely similar to another. This proposition, in so far as regards man, is the foundation-stone of physiognomy. There may exist an intimate analogy, a striking similarity between two men, who yet being brought together, and accurately compared, will appear to be remarkably different. No two minds perfectly resemble each other. Now, is it possible to doubt that there must be a certain native analogy between the external varieties of countenance and form and the internal varieties of the mind? By anger the muscles are rendered protuberant: are not, then, the angry mind, and the protuberant muscles, as cause and effect? The man of acute wit has frequently a quick and lively eye. Is it possible to resist the conclusion, that between such a mind and such a countenance there is a determinate relation?

Every thing in nature is estimated by its

physiognomy; that is, its external appearance. The trader judges by the colour, the fineness, the exterior, the physiognomy of every article of traffic; and he at once decides that the buyer "has an honest look," or "a pleasing or forbidding countenance."

That knowledge and science are detrimental to man, that a state of rudeness and ignorance is preferable, and productive of more happiness, are tenets now deservedly exploded. They do not merit serious opposition. The extension and increase of knowledge, then, is an object of importance to man: and what object can be so important as the knowledge of man himself? If knowledge can influence his happiness, the knowledge of himself must influence it the most. This useful knowledge is the peculiar province of the science of physiognomy. To conceive a just idea of the advantages of physiognomy, let us for a moment suppose that all physiognomical knowledge were totally forgotten among men; what confusion, what uncertainty, what numberless mistakes would be the consequence! Men destined to live in society must hold mutual intercourse. The knowledge of man imparts to this intercourse its spirit, its pleasures, its advantages.

Physiognomy is a source of pure and exalted mental gratification. It affords a new view of the perfection of Deity: it displays a new scene of harmony and beauty in his works; it reveals internal motives, which without it would only have been discovered in the world to come. The physiognomist distinguishes accurately the permanent from the habitual, the habitual from the accidental, in character. Difficulties, no doubt, attend the study of this science. The most minute shades, scarcely discernible to the unexperienced eye, denote often total opposition of character. A small inflexion, diminution, lengthening or sharpening, even though but of a hair's breadth, may alter in an astonishing degree the expression of countenance and character. How difficult then, how impossible indeed, must this variety of the same countenance render precision! The seat of character is often so hidden, so masked, that it can only be detected in certain, perhaps uncommon, positions of countenance. These positions may be so quickly changed, the signs may so instantaneously disappear, and their impression on the mind of the observer, may be so slight, or these distinguishing traits themselves so difficult to seize, that it shall be impossible to paint them or describe them in language. Innumerable great and small accidents, whether physical or moral, various incidents and passions, the diversity of dress, of position, of light or shade, tend to display the countenance often in so disadvantageous a point of view, that the physiognomist is betrayed into an erroneous judgment of the true qualities of the countenance and character. Such causes often occasion him to overlook the essential traits of character, and to form a decision on what is purely accidental. How surprisingly, for instance, may the smallpox disfigure the countenance, and destroy or confound, or render

imperceptible, traits otherwise the most decisive!

We shall then, continues Lavater, grant to the opposer of physiognomy all he can ask; and yet we do not live without hopes that many of the difficulties may be resolved which at first appeared inexplicable.

He then proceeds to a specific illustration of his subject under a great variety of titles, in which he treats of human nature in general, and of each particular feature separately.

To enumerate the different divisions of his book would not be more satisfactory to our readers than the perusal of the contents of the book itself: and an attempt to epitomise even the essential substance of the vast multiplicity of matter contained in his essays (which are yet only fragments, and to which indeed he himself does not pretend to give any higher appellation), would extend this article to a disproportionate length. Such an abridgement, after all, would convey no solid information on a subject which merits all the time and study that an attentive perusal of Lavater's works at large would require.

From the historical deduction of the literary progress of physiognomy which we have thus attempted to lay before our readers, it appears, that although the science has fallen into disrepute, there can scarcely be mentioned a period in which any cultivation of science took place when physiognomy was not likewise the study, nay sometimes even the profession, of men of the most eminent abilities and the greatest learning.

The reasons why at present so little attention is paid to the subject probably are,

1. That it has been treated in conjunction with subjects now with propriety exploded: and,

2. That it has been injured by the injudicious assertions and arguments of those who have undertaken its defence.

Sometimes, however, the wise and the learned may err. The use of any thing must not be rejected for no better reason than that it is capable of abuse. Perhaps the era is not distant when physiognomy shall be reinstated in the rank which she merits among the valuable branches of human knowledge, and be studied with that degree of attention and perseverance which a subject deserves so essentially connected with the science of man.

That there is an intimate relation between the dispositions of the mind and the features of the countenance is a fact which cannot be questioned. He who is sinking under a load of grief for the death of an affectionate wife or a dutiful child, has a very different cast of features from the man who is happy in the prospect of meeting his mistress. A person boiling with anger has a threatening air in his countenance, which the most heedless observer never mistakes; and if any particular disposition be indulged till it become habitual, there cannot be a doubt that the corresponding traces will be so fixed in the face as to be discernible by the skilful physiognomist, under every effort

made to disguise them. But when we attempt to decide on a man's intellectual powers by the rules of this science, we are often deceived: and in this respect we have reason to believe that Lavater himself has fallen into the grossest mistakes.

The latest popular attempt at any department of this science was that of Dr. Gall of Vienna, in his lectures on what he chose to denominate craniology, although he affected to be displeased at every attempt to connect his own peculiar study with that of physiognomy. The theory of this learned but as it appears to us extravagant philosopher endeavoured to account for every variety of habit or of feeling, and in reality for all the animal senses of every kind both external and internal, by supposing some particular part of the brain to be allotted to each peculiarity, and that the general character and temper of the individual is the result of the different proportions which these different parts or chambers of the brain bear to one another. He supposes also that this organ is possessed of two distinct sets of nervous fibres, a secretant and an absorbent; both directly connected with what is called the cineritious or ash-coloured department of the brain; the former issuing from it and secreting the fluid of the will, or that by which the mind operates on the muscles; and the latter rather terminating in it, and conveying to it the fluid of the external senses, secreted by those senses themselves, and communicating a knowledge of the presence and degree of power of external objects. This elaborate theory and the facts to which it appeals were very minutely investigated about three or four years ago, by a very excellent committee of the physical class of the French National Institute, assisted by M. Spurzheim, the most intimate friend and co-adjutor of the inventor; who, after a very minute and cautious research, gave it as a part of their report that the doctrine of the origin and action of the nerves is probably correct; but that this doctrine does not appear to have any immediate or necessary connection with that part of Dr. Gall's theory which relates to distinct functions possessed by distinct parts of the brain. In refutation, however, of this last part of the theory it will only be sufficient to observe, that while many of the nerves productive of various functions originate in the same part of the brain, others confined to the same function originate in various parts. Thus the cerebrum, which gives birth to the olfactory and ophthalmic nerves, gives birth also to the oculorum motorii; the cerebellum gives birth to both the trochleatores and the trigemini; and the medulla oblongata to the auditory, the par vagum and the lingual. For more on this subject, see CRANIOGNOMY.

PHYSIOLOGICAL. *a.* (from *physiology*.) Relating to the doctrine of the natural constitution of things (*Boyle*).

PHYSIOLOGIST. *s.* (from *physiology*.) A writer of natural philosophy.

PHYSIOLOGY. (*φυσικη*, nature, and *λογος*, doctrine, science, or treatise.) The science of na-

ture; physics; natural philosophy; the philosophy of physics or of nature.

Such is the literal meaning of the word; and such was, at one time, the subject it was employed to designate. As the terms natural history, however, have been of late years limited to the history of organized nature, physiology has, in like manner, been limited to the philosophy of natural history, in the same restricted sense; and is now commonly used to import general or synthetical views of organized life, whether in regard to plants or animals; and is occasionally, indeed, confined to those of animals alone.

To controvert the erroneous use of a term is the purport of the etymologist, the grammarian, and the critic, but not of the editor of a dictionary of arts and sciences. We are therefore compelled to take the word in the common, though erroneous, sense in which we find it in the present day, and shall consider it as simply referring to the more important phenomena of vegetable and animal life.

Vegetable Physiology.

The best writers in the present day upon this subject as a whole are M. Wildenow, M. Mirbell, and Dr. Smith: besides whom, there are many others that have touched upon particular parts with great advantage, and among these it would be unjust not to mention the names of Dr. Darwin, Mr. Knight, and Mr. Ellis. We must, in as few words as we can, give the general result of their separate pursuits and observations. Plants and animals are equally the progeny of seeds: there are other modes of production to be met with perhaps in both instances, as those of buds and bulbs, of slips and cuttings, but the common mode belonging to both is that of semination.

The seed is sometimes naked, but more generally covered with a pericarp, whence plants become naturally divided into the two grand classes of gymnospermous, and angiospermous. The pericarp is of various forms and structures; and of these the more common are the legume, silique, or siliqua, being merely varieties of what, among ourselves, is denominated in popular language, pod or pod; the loment, which is a kind of pod not so frequent as either of the former, but of which we have an instance in the mimosas and cassia fistula, the pome or core-apple, of which we have instances in the common-apple, and the orange; the drupe, or stone-apple, instances of which occur to us in the plum, cherry, and almond; the glume or chaff; the berry; the acinus or conglomerate berry, as in the rasp; the nut; and the capsule.

Stripping off this outer covering, we find the seed to consist internally of a coraculum, corcle, or little heart, and externally of a parenchymatous substance surrounded with a double integument, sometimes single, sometimes bifid, and sometimes more than bifid, and hence denominated monocotyledonous, dicotyledonous, polycotyledonous; in plain English, seed-lobes, or seed-leaves, single, double, or more than double. It was very generally supposed formerly, and is still supposed by some botanists, that the seeds of various orders of plants, as the mosses, fungi, and algae, are acotyledonous, or totally destitute of a cotyledon of any kind. But as many, perhaps most plants of this kind have of late been discovered to possess some such parenchyma, we have great reason to believe that this organ is universal, and that there is no such thing as an acotyledonous seed in the whole

vegetable kingdom. In reality the cotyledon appears absolutely necessary for the germination and future growth of the seed, and may hence be denominated its lungs or placental. Like the perfect plant, it possesses lymphatics and air-vessels. Through the former of these it absorbs the moisture of the soil into which it is plunged, decomposes a part of it into its elementary principles, and conducts those principles together with the undecomposed water to the corcle, which becomes stimulated to the process of germination by the oxygen thus set at liberty; while through the latter it breathes forth its excess of oxygen, together with a considerable portion of carbonic acid, and hydrogen gasses, and generally some portion of azot.

It is the corcle, then, which is the true punctum saliens of vegetable life, and to this the cotyledon is subservient. The corcle consists of two parts, an ascending and a descending; the former called its plumule, which gives birth to the trunk and branches, the latter denominated its rosetel, which gives birth to the root and radicles. The position of the corcle in the seed is always in the vicinity of the hilum or eye, which is a cicatrix or umbilicus, remaining after the separation of the funis or umbilical cord from the pericarp to which the seed has hereby been attached. The first radicle or germinating branch of the rosetel uniformly elongates, and pushes into the earth, before the plumule evinces any change: like the cotyledon, the radicles consist chiefly of lymphatics and air-vessels, which serve to separate the water from the soil, in order that the oxygen may be separated from the water.

Hence originates the root, unquestionably the most important part of the plant, and which, in some sense, may be regarded as the plant itself: for if every other part of the plant be destroyed, and the root remain uninjured, this organ will regenerate, and the whole plant be renewed; but if the root perish, the plant becomes lost irrecoverably. Yet there are various phenomena in vegetable life that manifest a smaller difference in the nature of the root and the trunk, than we should at first be induced to suppose; for in several species, and especially those of the prunus and salix tribes, if the stem branches be bent down to the earth, plunged into it, and continued in this situation for a few months, these branches will throw forth radicles; and if, after this, the original root be dug up, and suffered to ascend into the air, so that the whole plant become completely inverted, the original root will throw forth stem-branches, and bear the wild fruit peculiar to its tribe. The rhizophora, mangle or mangrove-tree, grows naturally in this manner; for its stem-branches, having reached a certain perpendicular height, bend downwards of their own accord, and throw forth root-branches into the soil, from which new trunks arise, so that it is not uncommon, in some parts of Asia and Africa, to meet with a single tree of this species covering the oozy waters in which it grows, with a forest of half a mile in length.

The solid parts of the trunk of the plant consist of cortex, cuticle, or outer bark, liber, cutis, or inner bark, albumen, or soft wood, lignum, or hard wood, and medulla, or pith. Linnæus gave the name of medulla to the pith of plants, upon a supposition that it had a near resemblance to the medulla spinalis of quadrupeds. A closer investigation, however, has since proved, that this resemblance is very faint, and that the pith or medulla

of vegetables consists of nothing more than a mere spongy cellular substance, forming indeed an admirable reservoir for moisture; and hence of the utmost importance to young plants, which, in consequence of their want of leaves and branches whose surfaces are covered with the bibulous mouths of innumerable lymphatics, would otherwise be frequently in danger of perishing through absolute drought; but gradually of less use as the plant advances in age, and becomes possess of these ornamental appendages; and hence, except in a few instances, annually encroached upon, and at length totally obliterated by the surrounding lignum.

All these lie in concentric circles, and the trunk enlarges, according to the theory of Grew and Malpighi, by the formation of a new liber or inner bark every year; the whole of the liber of one year, excepting indeed its outermost layer, which is transformed into cortex, becoming the alburnum of the next, and the alburnum becoming the lignum: but according to Mr. Knight's recent and very ingenious and well supported theory, it enlarges by an annual transfer of a layer of the preceding year's alburnum into a state of wood, a new layer being formed every year to take the place of that which is thus transferred. Whence it is obvious, that a mark of any kind which has penetrated through the outer into the inner bark, must in a long process of years be comparatively transferred to the central parts of the trunk; on which account we often find in felling trees of great longevity, as the oak, for example, the date of very remote national æras, and the initials of monarchs who flourished in very early periods of our national history, stamped in the very heart of the timber on its being subdivided.

As these series of concentric circles, moreover, produced by the growth of every year, are still visible after the conversion of every other part into lignum or hard wood, we can trace the age of a tree, with a considerable degree of certainty, by allowing a year for every outer circle, and about two or three years for the complete lignification of the innermost.

Independently of these more solid parts of the trunk or stem, we generally meet with some portion of parenchyma and cellular substance, and always with the different systems of vegetable vessels disposed in one common and uniform arrangement. The lower orders of plants, indeed, such as the annuals and biennials, consist almost exclusively of parenchyma or cellular substance, with an inner and outer bark, and the respective vessels of the vegetable system.

These vessels are adducent and reducent, or arteries and veins, pneumatic or air-vessels, and lymphatics. The lymphatics lie immediately under the cuticle and in the cuticle. They anastomose in different ways through their minute intermediate branches, and, by surrounding the apertures of the cuticle, perform the alternating economy of inhalation and exhalation. Their direction varies in different species of plants, but is always uniform in the same species.

Immediately below these lie the adducent vessels or arteries; they are the largest of all the vegetable vessels, rise immediately from the root, and communicate nutriment in a perpendicular direction; and when the stem of a plant is cut horizontally they instantly appear in circles. Interior to these lie the reducent vessels or veins, which are softer, more numerous, and more minute than the arteries, and in young shoots run down

through the cellular texture and the pith. Between the arteries and veins are situated the air-vessels as they were formerly called, but which Dr. Darwin and Mr. Knight have sufficiently succeeded in proving to contain not air in their natural state, but sap. They are delicate membranous tubes stretching in a spiral direction, the folds being sometimes close to each other and sometimes more distant, but generally growing thicker towards the root, and especially in ligneous plants. These vessels also are very minute, and according to numerous observations of Hedwig made with the microscope, seldom exceed a 290th part of a line, or a 3000th part of an inch in diameter.

The lymphatics of a plant may be often seen with great ease by merely stripping off the cuticle with a delicate hand, and then subjecting it to a microscope; and in the course of the examination we are also frequently able to trace the existence of a great multitude of valves, by the action of which the apertures of the lymphatics are commonly found closed. Whether the other systems of vegetable vessels possess the same mechanism, we have not been able to determine decisively; the following experiment, however, should induce us to conclude that they do. If we take the stem of a common balsamine, or of various other plants, and cut it horizontally at its lower end, and plunge it, so cut, into a decoction of Brazil wood, or any other coloured fluid, we shall perceive that the arteries or adducent vessels, as also the air-vessels, will become filled or injected by an absorption of the coloured liquor, but that the veins, or reducent vessels, will not become filled; of course evincing an obstacle, in this direction, to the ascent of the coloured fluid. But if we invert the stem, and in like manner cut horizontally the extremity which till now was uppermost, and plunge it so cut into the same fluid, we shall then perceive that the veins will become injected, or suffer the fluid to ascend, but that the arteries will not; proving clearly the same kind of obstacle in the course of the arteries in this direction, which was proved to exist in the veins in the opposite direction, and which reverse obstacles we can scarcely ascribe to any other cause than the existence of valves.

By this double set of vessels, moreover, possess of an opposite power, and acting in an opposite direction, the one to convey the sap or vegetable blood forwards, and the other to bring it backwards, we are able very sufficiently to establish the phenomenon of a circulatory system, and, according to several of the experiments of M. Willdenow, it seems probable that this circulatory system is maintained by the projectile force of a regular and alternate contraction and dilatation of the vegetable vessels. Yet the great minuteness of these vessels must ever render it extremely difficult to obtain any thing like absolute certainty upon this subject. Nor could we establish the fact should we by any means be able to determine the cause of their propulsive or contractile power; for no experiments hitherto made have proved vegetables of any kind, even the most irritable of them, as the mimosas, the drosera, the hedyasrum gyrans, to be possessed of any thing like muscularity of fibre. Grew ascribed the ascent of the sap to its levity as though acting with the force of vapour; Malpighi to an alternate contraction or dilation of the air contained in what he erroneously conceived to be air-vessels, and which now appear to be nutritive vessels; Perrault to fermentation;

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Hales and Tournefort to capillary attraction: not one of which theories however will better explain the fact than another, as Dr. Thomson has very ably established, *Chem. V.* 388; as he has also the probability of the existence of a contractile power from some cause or other in the different sets of vegetable vessels.

In what part of a plant the vital principle chiefly exists, or to what quarter it retires during the winter, we know not: but we are just as ignorant in respect to animal life. In both it operates towards every point; it consists in the whole, and resides in the whole; and its proof of existence is drawn from its effecting almost every one of its functions and combinations in direct opposition to the laws of chemical affinity, which would otherwise as much control it as they control the mineral world, and which constantly assume an authority as soon as ever the vegetable is dead. Hence the plant thrives and increases in its bulk, puts forth annually a new progeny of buds, and becomes clothed with a beautiful foliage of lungs, every leaf being a distinct lung of itself, for the respiration of the rising brood; and with an harmonious re-action that can never be too much admired, inhales for its support, from the surrounding atmosphere, the carbonic acid gas which is irrespirable by animals, and throws forth the pure oxygen on which animal respiration depends.

Animal Physiology.

The approach from vegetable to animal life is by shades, almost, and sometimes altogether, imperceptible. Even that ammoniacal smell which has been conceived to be chemically characteristic of the former origin, is given forth by the clavaria and several other funguses: nor is it long since this genus was actually regarded as a zoophyte, while to this hour it remains in Millar arranged along with the corals and corallines.

Generally speaking, however, and with respect to all the more perfect and elaborate kinds, we may observe that while the principle of life in vegetables evinces no other powers that can be fairly traced than those of irritability and contractility, it superadds to these, in animals, the higher powers of muscularity, sensation, and consciousness.

Animal physiology is a science as yet in its infancy, though from the antiquity of its birth it might have been expected long ere now to have made a much greater progress towards maturity. Many circumstances, however, have checked its growth, and not a few derived from general science itself, and which were started with a view of accelerating its progress. Such more especially have been the fond and sickening favouritisms that have been bestowed upon it by almost every branch of science in its turn. It was once almost killed by the kindness of the metaphysicians, and was afterwards as nearly destroyed by the dandling of the mechanical philosophers; nor has it been put in the right track, or given proofs of any thing like healthful vigour, or a promise of maturity, till assisted by the discoveries of chemistry, and the labours of the comparative anatomist.

To the first of these it is very essentially and very extensively indebted, and it may literally be said to have

Grown with its growth and strengthened with its strength.

From a small beginning, and from modestly professing to observe merely the different phenomena which are the effects of heat and mix-

ture, chemistry has risen, like astronomy, to the first eminence among the sciences. By its numerous researches it has found widely diffused over nature a variety of singularly active bodies, which have been generally called salts. Of these salts it has noticed some which change a blue vegetable tincture into green, and others which change that tincture into red: the former of these it has called alkalis, and the latter are known by the name of acids. It has observed, that when acids and alkalis are brought into contact, and either of them nearly in a fluid state, they encounter with violence effervescence and heat, and form a salt, which, being neither acid nor alkaline, is called neutral. It has been remarked that all these salts, whether volatile or fixed, whether fluid or concrete, have each permanently uniform characters; and that, though sometimes blended in a mixture, or made to vanish in a solution, yet, when they are separated, they resume their taste, their smell, their colour, and their form, and exhibit as before the same power in dissolving earths, metals, and stones, and in making inflammable bodies to smoke, to kindle, and explode with a loud noise. All, however, act not alike upon all bodies; those acids which dissolve iron remain quite harmless upon gold. And chemistry here has been led to observe that particular salts show a preference for particular bodies, that there is in them an appearance of choice, and that their character is never to be known but by studying their different elective attractions.

Besides salts, chemistry of late has also discovered a number of bodies that are still more wonderful, still more active, and some of them at least still more widely diffused over nature. These are certain aeriform fluids which are called gasses: these gasses, like the mind itself, are discernible only by their effects; all are elastic, and all are combined with the principle of heat. Their kinds are various; some are inflammable, some are saline and soluble in water, some are neither the one nor the other, and some distinguished by the name of airs, maintaining combustion and respiration: their importance is such, that there is not a single process in chemistry, nor perhaps one regular process in nature, in which the phenomena of the disengagement or fixation of heat, and the disengagement or fixation of elastic fluids, are not observed either separately or together. Two of these fluids compose water, two the nitric acid, two ammonia, and three of them are found in atmospheric air; one of them has been plausibly thought to be the alkaligenous principle in bodies, and two of them to be the constituents of oil: the principle of acidity is sufficiently ascertained to be one of the two which compose water. The same fluid oxydates metals, supports flame during combustion, communicates heat to the circulating blood, and maintains life in the act of respiration.

Such are a few of the general and admitted phenomena; and to which we must adhere till the later experiments have been more completely established, and the theories which have originated from them are divested of their doubts.

By that knowledge which it thus has acquired of salts and of gasses, by its more ingenious modes of analysis, and by some discoveries which it has made concerning the nature of heat and of light, chemistry is now able to account for many phenomena that before were inexplicable. In France particularly it has been recently extending its researches with a good deal of ardour towards the phenomena of both the animal and vegetable

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kingdoms: it has there found its salt and its gasses, its heat and its light, active and busy.

It is more than a century since it observed that plants were nourished by pure water and atmospheric air; that from these alone they derived their extracts, their mucilage, their oil, their coal, their acids, their alkalis, and aroma. But since the discovery of different kinds of elastic fluids, it has farther remarked, that they grow rapidly in hydrogenous gass, and in air mixed with carbonic acid; that assisted by light their leaves absorb hydrogen from water, carbon from the acid of which they are so fond; and, thus decomposing the one and the other, disengage from both the oxygenous principle, or vital air, and restore to the atmosphere salubrity and health.

Leaving vegetables, which, by analysis in close vessels and in red-hot pipes, it has reduced to hydrogen, oxygen, azot, and charcoal, it has made discoveries no less important in the animal kingdom. It has found that the food of the nobler animals, which immediately or remotely is prepared by vegetables, is generally acted upon by a solvent: it has proved by experiment, that the animal organs can fix azot; can decompose atmospheric air; can form lime, iron, and carbonic acid, as well as vegetables, produce a number of saline substances, which no art could detect in their food. Nor is it here that such discoveries are meant to terminate; these seemingly creative powers of vegetation and of animalization, with other phenomena in the structure and economy of living bodies, chemistry imagines that it will yet be able to explain. We may safely venture, however, to predict, that something more than its present knowledge of the various effects of heat and of mixture will in this case be found necessary to ensure success. The late discovery of elastic fluids and their singular properties affords the strongest reasons to suspect that we yet may be ignorant of many agents which nature employs in the functions of bodies. But whatever be the truth, we are almost certain that these agents discovered by the chemists are not alone concerned. Electricity, magnetism, and what have been called animal electricity and animal magnetism, must not be excluded from acting some part. The growth of plants, it is well known, is considerably affected by the electrical state of the atmosphere; it is sensibly promoted by a proper use of the vegeto-electrometer, and has been said to indicate a difference between the negative and positive electricities, whether these be kinds or states of the fluid. Such too is our present knowledge, that electricity as yet seems the only cause to which we can ascribe the seeming chemical affinities of the dew; its constant practice in avoiding some bodies, its predilection for others, and particularly its attachment to the living points of plants and of leaves: nor is this electricity wholly unconnected with the animal kingdom; when we think of its singular fondness for points, it occurs that one intention of our hairs may probably have been to collect and diffuse it. It is plainly excited in cross rubbing the hair of some animals; and when we wear silk, it is frequently accumulated upon the surface of our own bodies.

The iron found in plants and in animals is certainly somewhat of a striking circumstance, and cannot be denied to be one reason why magnetism should not be wholly overlooked.

As for animal electricity, or what has been called so, it is now, we believe, generally allowed to hold an important place in the system. It is

very perceptible in all those nerves which are subservient to voluntary motions; nor is it limited to these alone. In several instances where metals were applied to the nerves of the heart, which nature has destined to spontaneous motions, they were seen to awaken the dormant powers in the muscular fibres of that viscus. We here speak only of the nerves; but the torpedo, the gymnotus electricus, and silurus electricus, possess a particular structure of organs for collecting this fluid, for discharging it at pleasure, and for giving a shock. If those who are accustomed to the common kind of electrical experiments may at first be surprised that this electric fluid in the animal is not discharged from the nerves by water, or any other metallic conductor that is pure and unmixed, another fact, which is fully as striking, though it has not been hitherto mentioned by any observer known to us, appears to merit equal attention: Cut away the leg of a frog, uncover a part of the crural nerve, place the limb now on a table on which an electrifying machine is working, you will see the muscles strongly convulsed at every spark which you draw from the conductor, but remaining motionless upon the discharge of the Leyden phial.

The aid which anatomy affords to physiology is next to be considered. Physiology in general and the study of anatomy are so closely connected, that, as Haller imagined, they can hardly be separated even in idea. In his opinion, the man who should attempt to become a physiologist without anatomy, would act as wisely as the mathematician who, without seeing the wheels or the pinions, or without knowing the size, the proportions, or the materials of any machine, would yet presume from mere calculation to determine its powers, its properties, and uses. In this comparison, the importance of anatomy, we are really persuaded, is not represented in a light too strong; nor does that medium through which it has been viewed appear to have been magnified beyond nature.

Whether art or science, anatomy is one of those eminent accomplishments without which no one is able to prosecute his studies with half that pleasure and success which he might in either the animal or vegetable kingdoms.

To his lasting praise, and the singular improvement of true physiology, the anatomist has examined the living body, and has there observed, that all motion proceeds immediately from the muscular fibre; that the muscular fibre again derives its power from the nerve, which terminates in the brain; that fibre and nerve, and the whole system, are nourished by the blood which comes from the heart; and that the waste of blood is supplied by the lacteals, which absorb nutritious matter from the food as it passes along the intestinal canal.

He has also observed, that the blood, which is in continual motion, has a circular course; that other vessels along with the lacteals are employed to absorb; and by means of injection has shown the route of the different fluids as clearly in the dead as they could have been seen in the living subject.

When his eyes have failed in tracing objects that were too minute for unaided sight, he has called in the help of the microscope, and discovered the red globules of the blood, animalculæ in the semen, and the anastomoses of the arteries and veins; and when the microscope could lead him no further, he has had recourse to chemical

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analysis, and made discoveries equally important in demonstrating the bodies which compose the several fluids and the solids.

Besides these services which the anatomist has rendered to physiology, the science is likewise greatly indebted to him for those various and ingenious methods which he has taken to diffuse his knowledge. Whatever has occurred remarkable or rare he has studied to preserve, either dried, or in fluids that resist putrefaction. By corroding the parts which he has injected, in a certain acid, he has given an idea of the vascular system, which is at once instructive and elegant. Where it has been necessary to destroy the parts when incapable of preservation, or where the preservation would have been expensive, he has not neglected to represent them in models of wax, or to perpetuate them in accurate casts of lead or of stucco: and, lastly, that the valuable fruits of his labours might not be confined in his room of preparations or to his pupils, he has described most of them in drawings, has multiplied his drawings by correct engravings; he has even published his numerous engravings, and, to render them intelligible, has illustrated each with copious explanations.

Formerly, indeed, and in reality till within the last half century, anatomy was principally studied with a view to the art of surgery: but it has of late taken a much more extensive and liberal scope; and the bodies of brutes of all kinds have been dissected, and the vast diversity of their structures investigated, with the express intention of enlarging our knowledge upon the subject of physiology. In addition to which the bowels of the earth have been cautiously scrutinized for petrified remains of species, kinds, and orders that have been extinct for ages; and thus geology has been called in to contribute with her powerful aid (for powerful it has of late been discovered) towards the common object.

Every science can only be studied accurately under distinct chapters or divisions; and it has always been an object, and always ought to be so, to give such divisions a methodic arrangement. This plan has, therefore, been pursued in a variety of instances, in regard to physiology; but it has seldom been pursued with great success. It has been thought by many speculatists advisable to attempt one common system for the sister studies of anatomy and physiology; and possibly some few advantages might hereby be attained on the score of simplicity. Yet, for a variety of reasons, such an union is not possible. Anatomy examines for the most part the dead subject; physiology altogether the living: the chief object of attention to anatomy is the structure of the organ; the chief object of attention to physiology is the powers of the function: the former confines its views to what is visible and palpable; the latter extends them from what is visible and palpable to what is consequent and probable.

Amongst the best physiological systemists of modern times, we may mention the names of Haller, Daubenton, Vic d'Azyr, and Richerand; and it may be advantageous to take a brief survey of their respective views upon this subject.

There is great simplicity, and an elegant climax in the scheme of the first of these writers; but it is a scheme of very limited extent: it is chiefly drawn from the organs and functions of the human subject, and chiefly, therefore, limited to the subject from which it is drawn. Haller commences his celebrated *Outlines* with the simple fibre, and

the cellular texture, of which he is anxious to compose as many of the solids as he can. He then proceeds to more of the organs, describing with great erudition and care their different uses and structure in man. These organs, however, which he describes, and those analogous with respect to their structure, are confined to a part of the animal creation. As different classes of the animal kingdom have with similar functions varieties of organs, and as one function is consequently performed in different ways, it is evident that organs ought not to form the general divisions in any physiological system of arrangement, because we should then have a new arrangement for every new species of organs. Of this truth Haller and others have not been ignorant. They have also divided their subject into functions; but still they are functions in the manner performed by the human body. This body has engrossed so much of physiology, that we often see the functions explained with scarcely any allusion to their organs; as these are supposed to be always the same, and already known from the usual dissections.

Haller's physiology is professedly that of the human body. His conduct here was seemingly the effect of general custom: it did not arise from any contempt of comparative anatomy. There have been few who esteemed it so highly, who have studied it more, or applied it so skillfully. He declares there are many parts of our bodies whose functions can never be fully explained, unless we examine their structure in quadrupeds, in birds, in fishes, and even in insects; though he therefore had dissected of human subjects to the number of 350, yet the number which he dissected of brutes, and, what is more, dissected alive, was much greater. Numerous, however, as were his dissections, they were too confined for general physiology. That requires a range more extensive; and, to shorten the labour, different classifications of animals from any of those to be usually met with. This assertion hardly needs a proof.

There is nothing more certain, than that, were the anatomist to dissect animals as they occur in the system of Linnéus, or any other naturalist, his toil would be immense, and the knowledge which he thence would acquire of functions would scarcely be found to bear to it even the smallest proportion. By this observation we mean not to object to those ingenious classifications which Linnéus and others have employed to facilitate the study of zoology. All their classifications may be useful; and many display that extent and clearness of comprehension, that distinguishing acuteness, and that laudable ardour for the interest of science, which ought to render their authors immortal, and entitle them to the gratitude of future ages. Yet these systems, like those we have already observed with respect to anatomy, are formed with a view different from that which principally ought to direct the physiologist. They are meant to contain a full enumeration of the objects of zoology so far as known; to exhibit them arranged in different classes and subordinate divisions, according to such obvious and distinct marks as may strike at a glance, or appear on a cursory examination. To him who is entering on the study of zoology, they show at once the extent of his subject; they elevate his mind by the grandeur of the prospect; and when better employed than in pleasing the fancy, or in rousing the rapturous feelings of a poet, they draw his attention to those significant and marked signs in which the language of nature is written. They assist his

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judgment in the art of arrangement, and give to his memory a power of recollection which it had not before. To the natural historian they perform a service equally important, if not essential, to his undertaking: to him they supply the place of chronology; and instruct his readers by the chain of connection which they give to his thoughts, and by that perspicuity which they invariably bestow on his language.

These arrangements, however, with all their advantages, are not the arrangements which the physiologist must wish the anatomist to observe in his dissections. They are certainly useful in studying the manners, dispositions, and habits of different animals, and all that part of the outward economy which indicates something of their wisdom and design. But they little illustrate that internal structure on which this outward economy is founded, or tend to explain the more secret functions, which, not depending on the will of the creature, only display the power and omniscience of him who made it. This consequence is easily conceived, from considering the difference between zoology, and what has been defined physiology. Zoology is chiefly led to examine the animal kingdom as it usually presents itself to the eye, including a great variety of objects; physiology, only that single part of the animal economy which is chiefly made known by anatomy and chemistry. Zoology has been wont to divide its kingdom into so many classes or orders of animals; physiology, as we have already observed, must naturally divide

its economy into so many functions. Zoology has subdivided its classes by certain obvious and exterior marks, as the teeth and the claws; physiology must naturally subdivide its functions by the many varieties of those organs which are destined to perform them, as the different kinds of lungs and of stomachs. Zoology but cursorily mentions the functions as forming a part of the history of animals; physiology takes notice of animals only when they are of use to illustrate its functions. From this comparison it will readily appear, that things which are primary in a zoological will often be secondary in a physiological species of arrangement; and that things which are primary in a physiological will often be more than secondary objects in a zoological. This is very conspicuously the case in one of the grand divisions of Linnæus into mammalia, where the important secretory organs of the milky fluid are noticed only, like the colour of hair or the length of a tail, as a good outward mark of distinction.

We have dwelt the longer upon this subject because it applies in a considerable though not in an equal degree to the general table of Daubenton, the great associate of Buffon, and to whom the latter was chiefly indebted for his facts. This table we shall now subjoin; and the reader will see that although Daubenton had expressly declared that there was more of art than of nature, of outward show than of inward reference, in the common arrangements, it contains not the smallest allusion to the important function of digestion.

GENERAL CLASSIFICATION OF ANIMALS.

GENERAL CLASSIFICATION OF ANIMALS.							
WITH A HEAD.				THE MOST PART WITHOUT A HEAD.			
Nostrils.				Without nostrils.			
Ears.				Without ears.			
Two ventricles in the heart.		One ventricle in the heart.		The heart variously formed or unknown.			
Warm blood.		Blood nearly cold.		A whitish fluid instead of blood.			
Inspiration and expiration of the air at short intervals.		Inspiration and expiration of the air at long intervals.		Admission of air by gills.		Admission of the air by spiracula.	
Viviparous.				Oviparous.			
With teats.				Without teats.			
I. ORDER. <i>Quadrupeds.</i>	II. ORDER. <i>Cetaceous Animals.</i>	III. ORDER. <i>Birds.</i>	IV. ORDER. <i>Oviparous Quadrupeds.</i>	V. ORDER. <i>Serpents.</i>	VI. ORDER. <i>Fishes.</i>	VII. ORDER. <i>Insects.</i>	VIII. ORDER. <i>Worms.</i>
Four feet and hairy skin.	Fins and no hair.	Feathers.	Four feet and no hair.	Scales without feet or fins.	Scales with fins.	Antennæ.	Neither feet nor scales.

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It is plain from this table, and from what we have mentioned concerning Haller, that it would be injustice to physiologists and naturalists to say they have never paid any attention to correct modes of arrangements. It should rather be objected that they have not paid to them all that attention which they deserve; and that no general physiological system of arrangement existed till the attempt of D'Azyr.

This excellent writer has sufficiently shown that in such an arrangement functions should form its primary divisions; that its subdivisions should be the varieties of these functions; that the whole should be both distinguished and explained by the kinds and varieties of those organs by which they are performed; and that the descriptions of these organs might partly be collected from the several works of natural historians and comparative anatomists, as the dissections of the French academy, numerous fragments of the Curieux de la Nature, the collections of Blasius and Valentini, the writings of Haller, the works of the celebrated Hunters and Monros, the publications of Hewson and Cruikshank, and others

who have been making discoveries in the system of absorbents. D'Azyr has mentioned a great many more. He particularly recommends Per-rault, Du Verney, Collins, and Daubenton, on birds and quadrupeds; Charas, Roesel, and Fontana, on reptiles; Ray and Willughby, Artedi, the Gouans, and Broussonet, on fishes; Swammerdam, Malpighi, and Reaumur, the Geoffroys, Bonnet, and Lyonnet, on insects; and, lastly, the curious researches of Willis, Ellis, and Donati; of Trembley, Baker, Baster, and Boadsch; of Forskal, Adanson, Muller, Pallas, Spallanzani, and Diquemare, concerning worms, zoophytes, and poly-pes. Where any errors are to be corrected, or where any deficiencies are to be supplied, it is needless to observe, that recourse must be had to new examinations and to new dissections; in which it may be of some use to attend to the foods of animals, to their places of abode, and their modes of life, as circumstances leading to some internal varieties of structure. To this list of authors we should now add the names of Vic d'Azyr himself, Campfer, Blumenbach, Cuvier, Home, Darwin, Richerand, and Mirbell.

CLASSIFICATION OF THE FUNCTIONS OR PROPERTIES OF LIVING BODIES.

- | | | |
|-----------------|------------------|------------------|
| 1. Digestion. | 4. Respiration. | 7. Generation. |
| 2. Nutrition. | 5. Secretion. | 8. Irritability. |
| 3. Circulation. | 6. Ossification. | 9. Sensibility. |

Every body in which one or more of these functions are observed, is to be considered as possessing organization and life.

1 Digestion.	Living bodies which have	One or more stomachs, easily distinguishable from the œsophagus and intestinal canal,	{	Man.
		A stomach distinguishable only by certain expansions from the œsophagus and intestinal canal,		Quadrupeds.
		An alimentary canal, not distinguishable into œsophagus, stomach, and intestines,	{	Cetaceous animals.
		Neither stomach nor intestines,		Birds.
			{	Crustaceous animals.
				Oviparous quadrupeds.
			{	Serpents.
				Cartilaginous fishes.
			{	Fishes properly so called.
				Insects.
			{	Worms.
				Zoophytes.
			{	Plants.

2 Nutrition.	Living bodies whose nutritious juices are absorbed	By vessels beginning from internal cavities,	{	Man.
		By vessels opening upon the external surface,		Quadrupeds.
			{	Cetaceous animals.
				Birds.
			{	Oviparous quadrupeds.
				Serpents.
			{	Cartilaginous fishes.
				Fishes properly so called.
			{	Insects.
				Crustaceous animals.
			{	Worms.
				Plants.

P H Y S I O L O G Y .

3
Circulation.

Living bodies

with blood

- Having a heart with two ventricles and two auricles,
- With one ventricle divided into several cavities and two auricles,
- With one ventricle and one auricle,

- Man.
- Quadrupeds.
- Cetaceous animals.
- Birds.
- Oviparous quadrupeds.
- Serpents.
- Cartilaginous fishes.
- Fishes properly so called.

with juices with a whitish fluid

- Whose heart is formed of one longitudinal vessel, tuberos and contractile, in which there is a whitish fluid instead of blood,
- In which no heart has been yet observed, but only vessels filled with juices of a nature different from that of blood,

- Crustaceous animals.
- Insects.
- Worms.
- In some crustaceous animals there is observed something resembling a heart.

- Zoophytes.
- Plants.

4
Respiration.

Living bodies

which respire

- By lungs free from all adhesion and spongy,
- By lungs free from all adhesion, vesicular, and muscular,
- By lungs adhering to the ribs, and provided with appendages,
- By gills of different forms,
- By stigmata or holes in different rings,
- By an opening called trachea, or by external fringes,
- By tracheæ,
- In which there have been discovered neither stigmata nor tracheæ,

- Man.
- Quadrupeds.
- Cetaceous animals.
- Oviparous quadrupeds.
- Serpents.
- Birds.
- Cartilaginous fishes.
- Fishes properly so called.
- Crustaceous animals.
- Insects.
- Earth worms.
- Aquatic worms.
- Plants.
- Polypes.

5
Secretion.

Living bodies

- There are no bodies in which secretions are not carried on.

6
Ossification.

Living bodies

whose skeleton is

- Internal and osseous,
- Internal and cartilaginous,
- External and corneous,
- External and cretaceous,
- External and ligneous,
- Which have no skeleton,

- Man.
- Quadrupeds.
- Cetaceous animals.
- Birds.
- Oviparous quadrupeds.
- Serpents.
- Fishes properly so called.
- Cartilaginous fishes.
- Perfect insects.
- Lithophytes.
- Crustaceous animals.
- Shell-fish.
- Madrepores.
- The greatest part of zoophytes.
- Plants.
- Insects in their first state.
- Worms.
- Polypes.

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7 Generation.	Living bodies	which are	Viviparous,	Man.
			Oviparous, whether the evolution of the eggs takes place within or without the female,	Quadrupeds.
				Cetaceous animals.
8 Irritability.	Living bodies	which have	Which propagate by slips,	Birds.
				Oviparous quadrupeds.
			A body muscular or contractile,	Serpents.
				Cartilaginous fishes.
				Fishes properly so called.
				Insects.
				Crustaceous animals.
				Worms.
				Plants.
				Worms.
				Polypes.
				Plants.
9 Sensibility.	Living bodies	which have	Muscles covering the skeleton,	Greatest part of insects in the first state of their transformation.
				Worms.
			A skeleton covering the muscles,	Polypes.
				Man.
			No muscular power; no spontaneous movements,	Quadrupeds.
				Cetaceous animals.
				Birds.
				Oviparous quadrupeds.
				Serpents.
				Cartilaginous fishes.
				Fishes properly so called.
				Perfect insects.
				Crustaceous animals.
				Plants.
	Living bodies	which have	Nerves and brain easily distinguishable from the spinal marrow,	Man.
				Quadrupeds.
			Nerves and brain scarcely distinguishable from the spinal marrow.	Cetaceous animals.
				Birds.
			In which there have not yet been discovered nerves or brain, or spinal marrow.	Oviparous quadrupeds.
				Serpents.
				Cartilaginous fishes.
				Fishes properly so called.
				Insects.
				Crustaceous animals.
				Worms.
				Zoophytes.
				Plants.

The above table, which has its divisions marked by the functions, and their kinds and varieties by the kinds and varieties of those organs by which they are performed, differs considerably from a zoological table. Borrowing its several marks of distinction from internal characters, it more clearly demonstrates the difference between the mineral, vegetable, and animal, than any system that attempts to arrange by outward appearances.

No minerals, whatever be their forms or the regularity and beauty of their figures, were ever said to possess any thing like organs of nutrition; and however frequently some may recover their lost shapes, they are never supposed either to produce, or assist in producing, their own kind by generative powers. And no plants, however much may be said of animals that want a nervous system and a heart, and are fixed, without the power of loco-motion, to one place; we say, no plants, though some may represent a few of the simpler effects of sensation, and others may be free to float through the ocean, were ever said to discover

any signs of voracity, to possess any thing resembling a stomach, to distend their body by swallowing their food, to apply their food to the mouths of absorbents opening internally; and, when the nutritious juices were extracted, to eject it *in cumulo*. It has been said that zoophytes present similar phenomena. But what are zoophytes? One half of their name would imply that they are animals, and another half would insinuate that they are plants. Daubenton reasons with clearness on this subject. True, says he, the greatest part of them are branched like plants, and like plants are composed of concentric circles. Some have a soft exterior substance which is called bark, and a hard interior which is called wood. Along their branches, and at their extremities, they put forth vesicles which resemble buds; and when a part falls from the whole, it is sufficient, like a vegetable slip, to produce a zoophyte; but do these appearances prove that they are plants?

If ramifications constitute a plant, then many

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crystallizations will be plants; the shootings of frost on our windows will be plants; the silver tree of Diana a plant; our veins will be plants, our arteries plants; and our very feet, which ramify into toes, and our hands into fingers, will have some title to be called plants. The truth is, ramification is not universal in the vegetable kingdom; and although it be general, it is no more peculiar to plants, than swimming is to fishes, or flying to birds. If concentric circles constitute a plant, some bones of animals will then be plants, and some minerals must also be plants. The wood and the bark are only two metaphorical expressions, which with equal propriety might have been used of the bone and periosteum. But once suppose the zoophyte a plant, it was natural to carry on the analogy, and certainly necessary to have it provided with wood and bark; though it must be allowed that a corneous substance is not what we commonly mean by bark, nor an evidently hard calcareous substance what we mean by wood. The small vesicles, except in appearance, have no similarity to buds or fruits; they are the residences of small polypes, to whom the whole structure has been owing, by whom the whole either is now or has been inhabited, and to whom it answers the same purpose as the shell does to testaceous animals.

After thus endeavouring to point out the boundaries between the mineral, the plant, and the animal, before we begin to treat of the functions, we must also take notice of another distinction, the want of which has occasioned much unnecessary trouble, and has given rise to not a few ridiculous disputes. This is the distinction between living bodies and some ingenious contrivances of art, which are called machines. It has not been asserted that any machine can either grow or propagate its kind; that it can assimilate the particles of matter that come in contact; that it is able to repair the injuries which it may suffer; that it can accommodate itself to circumstances; can create heat when the cold is keen, or cold when the heat becomes too violent: yet it has been supposed, from established prejudices, and from the successive evolution of parts in plants and in animals, that there is an analogy between a machine and a living body. The living body has been

called a machine; and notwithstanding the acknowledged truth of that observation so often repeated since the days of Hippocrates, that the whole is a circle, that nothing is first and nothing last in the animal economy, we are still talking as if living bodies were nought but machines; we are still reasoning as if their parts had existed in succession, had acted in succession, were combined in succession; we are still seeking for what is prior and what is posterior, for what is derived and what is original in point of structure, as if we were examining a work of art; we speak gravely of the viscera, of the thorax deriving a coat from the membranous pleura, the abdominal viscera from the peritoneum, and the branches of nerves deriving a pair from the dura and pia mater of the head; we argue with people who maintain that fasciæ are nervous expansions, and the muscles themselves but nervous productions: and although we be hardly able to conceive how the brain could be nourished without blood thrown from the heart, or the heart move without the assistance of nerves from the brain, we are still disputing about which was prior and which was posterior in point of existence; a dispute that will probably terminate as soon as that of the ancients, whether the first eggs were from birds, or the first birds were hatched out of eggs.

These dark and inscrutable mysteries of nature we presume not to explain; they point out almost the creative hand, and bring us almost into the immediate presence of that Being by whom we live, move, and exist; and before whom the truly feeling and elevated mind is less disposed to examine than adore. We are only to observe, that from this coeval formation of parts which the microscopic power of anatomy has often distinguished from their evolutions, and from this mutual dependence of organs one on another, we are left at freedom to begin at any part of the circle, and treat of the general properties and functions of living bodies.

The arrangement of Vic d'Azyr has been remodelled and certainly improved by M. Richerand, who has also thrown it into a somewhat more systematic construction under the following form.

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CLASS I. FUNCTIONS CONTRIBUTING TO THE PRESERVATION OF THE INDIVIDUAL. (Individual life.)

FIRST ORDER.

By assimilating alimentary matters to his own substance.

(Assimilating, internal, or nutritive functions.)

GENUS I.—*Digestion.*
Extracts from it the nutritive parts.....

II.—*Absorption.*
Carries it into the circulating fluid.....

III.—*Circulation.*
Conveys it to all the organs.....

IV.—*Respiration.*
Combines it with the oxygen of the atmosphere.

V.—*Secretion.*
Makes it undergo various modifications.....

VI.—*Nutrition.*
Applies it to the organs for the purposes of growth and repair.....

Prehension of food.
Mastication.
Salivary secretion.
Deglutition.
Digestion.
Chylification.
Excretion of feces and urine.
Absorption of chyle.
—— lymph.
Action of vessels.
—— glands.
—— thoracic duct.
Action of the heart.
—— arteries.
—— capillary vessels.
—— veins.
Action of the parietes of the thorax.
—— lungs.
Changes in the air.
—— blood.
Animal heat.
Transudation of serum.
Mucous secretion.
Action of glands.
Differing in every part according to its peculiar composition.

SECOND ORDER.

By establishing his relations to surrounding beings..

(External, or relative functions.)

GENUS I.—*Sensations.*
Inform him of their presence.....

II.—*Motions.*
Enable him to approach to or avoid them.....

III.—*Voice and Speech.*
Give him the power of communicating with his species, without change of situation.....

Of sight.
— hearing.
— smelling.
— tasting.
— touching.
Action of the nerves.
—— brain.
Human understanding.
Perception.
Memory.
Judgment.
Volition.
Sleeping and waking.
Dreams.
Somnambulism.
Muscular organs and action.
Skeleton.
Articulations.
Standing.
Progressive motions.
Motions of the upper extremities.
The voice { articulated; or
speech:
modulated; or
singing.
Stammering.
Lisping.
Dumbness.
Ventriloquism.

FIRST ORDER.

Whether they require the co-operation of both sexes.....

SECOND ORDER.

Or belong exclusively to the female..

Conception.....

Generation.....

Gestation.....

Parturition.....

Suckling.....

General differences of sex.
Hermaphrodites.
Systems of generation.
Pregnant uterus.
History of the embryo.
—— fetus.
—— coverings of the fetus.
State of the uterus after parturition.
Lochia.
Action of the breasts.
Milk.

CLASS II. FUNCTIONS CONTRIBUTING TO THE PRESERVATION OF THE SPECIES..... (Life of the species.)

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<i>Growth of the body</i>	{	Infancy—Dentition—Ossification.
		Puberty—Menstruation.
<i>Manhood.</i>	{	Temperaments.
		Sanguineous. Choleric. Melancholic. Phlegmatic.
	{	Idio-syncrasies.
		Races of mankind,
	{	European. African. Asiatic. Australasian. American.
<i>Decline of the body.</i>		{
	Decrepitude.	
<i>Death.</i>		
<i>Putrefaction.</i>		

In our physiological observations upon these separate functions we shall adhere to this classification of M. Richerand, though we shall considerably deviate from the remarks which he has offered under each head, as not sufficiently interesting or popular for such a work as the present. We commence with the FIRST ORDER of his FIRST CLASS, comprising the functions that are contributory to the life of the individual, by assimilating alimentary matters to its own substance.

GENUS I.—*Digestion.*

This, in our opinion, is properly contemplated and characterised, as the first of the genera of functions under the class of those that serve to the preservation of the individual. The very acute and well informed author of the article upon this subject in the *Encyclopædia Britannica* has regarded respiration as the first of these functions in a systematic arrangement. His arrangement, however, is founded upon fetal life, and ours upon adult life. In the former view it is unquestionably correct: but then it is erroneous to take it in this view; for if the author had not himself immediately afterwards departed from it, he would have had no opportunity of describing digestion in any part of his plan; and as little of adverting to respiration, voice, or the various processes of generation, manhood, old age, and decrepitude; none of these belonging to the stage of life from whence his arrangement is deduced. The proper period from which the classification should be drawn is unquestionably that of maturity, or of life in its most perfect state; looking equally forward and backward, and in the actual possession of the greatest number of functions and of those functions in their fullest expansion and consummation.

Digestion is the process by which the liquid and solid part of the food undergoes its first preparation in the system, and as the effects of the digesting and assimilating powers are more surprising than any chemical process of art, it may not be unpleasant to take a particular view of them. It has long been observed, that those animals which are not carnivorous feed upon plants; and, since the days of Van Helmont and Boyle, it has been suspected that plants live upon water and air. This suspicion has now been confirmed by numerous experiments. Plants have been raised from distilled water without earth, and, instead of requiring a vegetable mould, have spread

their roots in moss, in paper, in cotton, in pieces of cloth, in pounded glass, and powder of quartz. From these facts, the ingenious Chaptal has been led to suppose that soils act but as so many sponges, affording water in different proportions, and in different ways; and that all that the plant wants from the soil is a firm support, a permission to extend its roots where it chooses, and that proportioned supply of humidity which will secure it against the alternatives of being inundated or dried up. To answer, however, these several conditions, he allows it to be necessary in many cases to make a proper mixture of the primitive earths, as no one in particular possesses them. Siliceous and calcareous earths (he says) may be considered as hot and drying, the argillaceous as moist and cold, and the magnesian as possessing intermediate properties. Each, in particular, has its faults, which render it unfit for culture. Clay absorbs water, but does not communicate it; calcareous earth receives and gives it too quickly: but the properties of these earths are so happily opposed that they correct each other by mixture. Accordingly we find, that by adding lime to an argillaceous earth, this last is divided, and the drying property of the lime mitigated, at the same time that the stiffness of the clay is diminished. On these accounts it is that a single earth cannot constitute manure, and that the character of the earth intended to be ameliorated ought to be studied before the choice of any addition is decided on. The best proportions of a fertile earth for corn are three eighths of clay, two eighths of sand, and three eighths of the fragments of hard stone.

“The advantages of labour consist in dividing the earth, aerating it, destroying useless or noxious plants, and converting them into manure by facilitating their decomposition.”

So far is vegetable mould from communicating any thing new to plants, that it rather owes its formation to them; and if sea salt should at times be requisite to marine vegetations, it is to be remembered that salts, sulphur, and lime, are all products of organized bodies; that iron itself has been discovered in plants and animals; and that even diamonds, quartz, crystals, spars, gypsum, &c. are found only in those earths that are partly composed of an impoverished vegetable residue, which provident nature seems to have reserved for the reproduction or reparation of the earthy and metallic substances of the globe; while the

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vegetable mould on these organic parts that remain is made to serve as nourishment for the growth of succeeding plants.

If those earths in which plants are reared, and which contain no vegetable mould, should ever be sensibly diminished in weight, a circumstance, we believe, which seldom takes place if proper precaution be used to prevent it; yet, if it should happen, it should not in that case be forgotten that gasses are the general cements in nature; that they mix intimately with the hardest bodies; and that this sensible diminution of weight may be owing entirely to some dissolution of the solid parts, and the consequent extrication of the gaseous fluids.

"Before we had acquired a knowledge of the constituent principles of water," resumes Chaptal, "it was impossible to explain or even to conceive the growth of plants by this single aliment. In fact, if the water were an element, or indecomposable principle, it would afford nothing but water in entering into the nutrition of the plant, and the vegetable would of course exhibit that fluid only; but when we consider water as formed by the combination of the oxygenous and hydrogenous gasses, it is easily understood that this compound is reduced to its principles, and that the hydrogenous gas becomes a principle of the vegetable, while the oxygen is thrown off by the vital forces. Accordingly we see the vegetable almost entirely formed of hydrogen. Oils, resins, and mucilage, consist of scarcely any thing but this substance; and we perceive the oxygenous gas escape by the pores where the action of light causes its disengagement."

But though water constitute the aliment of plants, we must not suppose that it is the aliment of these alone: the leech and the tadpole are nourished by water, and many animals have no other food. "Rondelet cites a great number of examples of marine animals which cannot subsist but by means of water by the very constitution of their organs. He affirms, that he kept during three years a fish in a vessel constantly maintained full of very pure water. It grew to such a size, that at the end of that time the vessel could no longer contain it. He relates this as a very common fact. We likewise observe, that the red fishes which are kept in glass vessels are nourished, and grow, without any other assistance than that of water properly renewed."

The ingenious Borelli, who knew that plants and several animals subsisted wholly by water and air, was likewise of opinion that some animals lived upon sand. He could discover nothing but sand in the stomachs of many testaceous animals that live in the water, and particularly in the stomachs of the smaller kinds that live buried in the sand of the sea. He could not conceive what else could be the food of those small fishes or worms which penetrate the substance of the hardest rocks, and form excavations that always bear a proportion to their bulk. He had regularly found that the stomachs of swans which he had examined were full of sand; and, recollecting the pebbles in the gizzards of fowls, he was led to infer that these substances were somehow dissolved in a gastric juice, and served to nourish the harder parts, as the shells, the feathers, and the bones. These sentiments, on a slight view, might not be unnatural. From observing children of depraved appetites swallowing sand, ashes, and cinders; from having sometimes met with sand in the stomachs of wild ducks; from the usual fæces of the

earth-worm; and from the dissection of several toads dug up in a garden, in whose stomachs we could see nothing but a quantity of earth, with pieces of coal, stone, and of slate, that had accidentally happened to be mixed with it, we long entertained a similar opinion with this celebrated author: but on recollecting that many substances which enter the stomach are not nutritious; considering the balls of hair and of feathers which the carnivorous animals return, and that quantity of faecal matter which is discharged by the intestines; having frequently experienced that a sense of fulness removes hunger, and observed persons as it were by instinct pressing on the empty stomach with their hand—we began to suspect that the swallowing of sand, and a number of other indigestible substances, might not be to nourish but to prevent some cravings of the stomach, and that these cravings were in part occasioned by a deficiency of the usual pressure which it receives from the neighbouring parts. In this opinion we were more confirmed, by hearing it was customary among some of the tribes of the north of Asia to repel or mitigate the attacks of hunger by placing a board over the region which is called epigastric, and compressing it gradually by means of cords as the stomach collapses; and by learning afterwards, on a farther enquiry, that a similar practice, and from similar motives, was likewise common with some individuals in this country; who, to alleviate the sensation of hunger, straiten the epigastric region with their handkerchief. This practice, however, being often impossible with the brute kind, instead of bringing the neighbouring parts to press on the stomach, they are obliged to distend the stomach, and to bring it to press on the neighbouring parts. Of the two ways of producing this pressure, the last is certainly the most natural. Senebier has supposed that distension of the stomach is the cause of the secretion of the gastric liquor; but how well or ill his opinion may be founded, daily experience permits not a doubt, that, in order to satisfy the calls of hunger, the stomach requires not only to be nourished, but to be filled, or at least to have something like a sense of fulness; and this may probably be one reason for those balls which are found in the stomachs of the chamois, which likewise swallows sand, and in the stomachs of the cow, the sheep, the horse, "when they do pass away the winter in snowy mountains, where they can find no grass."

From this general view of the food, the natural transition is to those organs by which it is prepared. As all plants are fed on nothing grosser than liquids, we see the reason why they are all nourished by absorbents, and why, instead of one common alimentary canal, they are furnished with a number of capillary vessels, which by their action assist the living power in moving the fluids along the trunk, the branches, and the leaves. These fluids are observed to move between the different ligneous circles, and the more copiously as the wood is younger or the nearer the circles are to the bark. In the circles themselves, it has been remarked that the sap-vessels, from being empty during a great part of the growing season, have been called air-vessels; that they are formed of spiral fibres, adapted to some peristaltic motion: and it is plain, that by this structure they are well fitted to propel their contents, whether water or air, upwards or downwards, backwards or forwards, according to the different positions of the plant.

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Besides the particular action of the vessels, a general concussion is received from the movement of the waters or winds, which serves as an exercise; a general dilatation is occasioned by both moisture and heat; and a general contraction by dryness and cold, which produce a motion something similar to that of the thorax.

In the springing season the sap ascends through the empty vessels before the leaves begin to appear. When the vessels are filled through their whole extent, the buds swell, the leaves spread, and the flowers blow; the evaporation from the surface is increased; the sap is diminished by the absorption; the succiferous vessels now cease to bleed; and the roots being unable to supply the waste, the rains and the dews enter by the trunk, the branches, the leaves, and the petals of the flowers. When the evacuations are immoderately increased by excessive heat, or preternaturally obstructed by the plucking of the leaves, by too much humidity, or other causes which prevent perspiration, the plant soon either sickens or dies. The chyle, which is formed in the sap vessels, has generally something of a saccharine taste.

Considering the forms of animal food, we may naturally expect in the animal kingdom a greater variety of those organs employed in digestion. Most animals have indeed, like the vegetable, both inhaling and exhaling vessels, by which some of their fluids are absorbed, and evacuations regularly carried on. Except, however, in those animals which subsist by liquids, these vessels are of little importance in receiving food or ejecting what is fecal from the system. In these animals the absorbents terminate in a hollow viscus, which is called the alimentary canal, where the fluids undergo a preparatory change, and are partly reabsorbed for assimilation. In all others the food enters by a proboscis, or by an aperture which is called the mouth: this mouth is properly the entrance of the alimentary duct. It is very generally furnished with a tongue, which is usually assisting in deglutition; and if the food be of that nature to require cutting, tearing, or grinding, it is likewise furnished with the proper instruments for these operations. When the food is testaceous or some hard vegetable substance, and these instruments not in the mouth, something similar may generally be expected in a more remote part of the canal. The crab and the lobster have accordingly grinding teeth in their stomach, and granivorous fowls have a powerful gizzard lined with a thick corneous substance. It possesses the compressing force of the jaws; and small pebbles which the animals swallow, serve it for teeth.

Besides mere trituration or grinding, the solid food will often require to be mixed with some additional liquid. In those carnivorous animals which chew, this liquid, during the time of mastication, flows into the mouth from certain glands placed in the neighbourhood. In some species of the ape kind a previous dilution takes place in two pouches situated on the sides of the lower jaw. In granivorous birds this dilution is very usually performed in a sac, which is a dilatation of the canal; and the food being macerated there by the glands or exhaling vessels, gradually passes down, as is needed, to be triturated and further prepared in the stomach. In the ruminating kind the dilution is performed in a similar manner: but these having no muscular stomach fitted for grinding, instead of descending the food is brought up again into the mouth, and is then after the proper mas-

tication sent to the stomach. If the food require no mastication, it is sent directly that way at first: a circumstance which shows a curious discernment with respect to foods, and proves that their alimentary canal is subject to the action of voluntary muscles as far as the stomach. Some of those birds which have a diluting sac or ingluvies seem likewise to ruminate. This in the parrot was observed by the gentlemen of the French academy. It has since been observed in rooks, macaws, cockatoos, and others: and Mr. Hunter, to whom physiology is so much indebted, discovered, that the male and the female pigeon secrete in their ingluvies a certain liquor for feeding their young; and that most kinds of what have been thought ruminating birds do very often in expressing their fondness regurgitate their food. Yet both this and another species of regurgitation, which is very common with those animals that swallow indigestible substances with their food, should be carefully distinguished from rumination.

To the ruminating kinds the diluting sac is by no means peculiar. The porpoise has one, though it does not ruminate; and many of those animals which have none, as the rat, the hog, and the horse, have a part of the stomach covered with a cuticle, and which must therefore principally serve as a reservoir. The gullets of several fishes and serpents are sacs of this kind. It frequently happens that a part of their prey is projecting from the mouth, while another part fills up the gullet and gradually descends, to be reduced in the solvent below. So very dilatable are the stomachs and gullets of some animals, that serpents have been often seen to swallow whole animals which, prior to the gorging, were larger than themselves; and many polypes, and even some of the louse kind, will, by swallowing food, more than double their own bulk.

Applying stomach as a general word to the different ventricles of the canal, we may here observe, that every species of animals which ruminate have two stomachs, or at least two divisions in one; that some have three, as the gazelle; and some four, as the cow, the dromedary, and the sheep; but it must not be supposed that the number of stomachs is any proof of a ruminating power. It was said already that the porpoise has two; the porcupine has three divisions in one; and the singular cassowary, although it be found to have four stomachs, does not ruminate: nor, although granivorous, is any one of the four a gizzard.

Somewhat different from these expansions which we have been mentioning as existing in the first part of the alimentary canal, is a sort of pouch which hangs from the neck and the lower mandible of several birds, and which, like the two pouches of apes, may be used either to macerate the food or to carry provisions from a distance to their young. The pelican, a native of warm countries, employs this pouch sometimes to carry a quantity of water; and another native of the same countries, we mean the dromedary, was observed to have at the top of the second of the four ventricles a number of square holes, which being the orifices of as many cavities between the membranes which compose the ventricle, reminded the gentlemen of the French academy of those large reservoirs of water which Pliny mentions to be in camels; and for which, according to his story, their guides have opened them sometimes in cases of extreme thirst.

We come now to one of the principal agents in

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digestion. Independent of the fluids which mingle with the food in the mouth, the gullet, or macerating sacs, there is one denominated the gastric juice, and which, either by itself or along with others from the aliments or system, acts in some measure as a solvent. It is secreted from large glands at the entrance of the gizzard, from vessels or glands in the coats of the stomach, and perhaps most plentifully near the pylorus: it powerfully resists the putrefactive fermentation; it coagulates milk and the white of an egg; it dissolves food even when inclosed in metallic tubes; and when life ceases, it acts frequently on the very stomach from which it was secreted. Its taste, its colour, and its solvent powers, are different in different classes of animals. It seems to be modified according to the age, the health, the habit, and the different aliments on which they live. The sick and the child are incapable of digesting the food that is proper for a healthy man. The hawk kind, after loathing bread and throwing it up without any change, can be gradually brought to take it for food; and Gassendi has mentioned a certain lamb, which, being fed on bread, cheese, and on flesh, refused afterwards to taste grass. But what is most surprising in the gastric juice is, that it spares all living bodies, as those worms which exist in the stomach, and the stomach itself while it is alive; and it differs otherwise from a chemical solvent, in that it has an assimilating power, and reduces all substances, whether animal or vegetable, on which it acts, to a certain fluid of determinate properties, which is called chyle.

Besides the gastric, the food again, after passing through the stomach, is mingled with a greenish saponaceous liquor, which is called bile, and which flows either immediately from the liver or from a vesicle into which it had regurgitated as into a blind gut: at the same time nearly it is mingled with another resembling the saliva from the pancreas or sweet-bread; a gland or glands whose place is supplied in a great many fishes by a number of vermicular appendages to the stomach.

In short, from one extremity of the alimentary canal to the other, fluids are perpetually flowing into its cavity from glands, vessels, or organic pores; and the membranes constantly secreting a mucus to protect themselves from the acrimony of their contents. This acrimony must often be considerable near to that end of the canal where the fæces are discharged; for, as the first part of the canal has generally one or more dilatations which are called stomachs, and secretes at least one fluid which is strongly antiseptic, so the last part has generally appendages which are called cæca, where the food always remains for some time, and where, from the quantity of animal matter that happens to be mixed with it, it becomes putrescent. The office of the cæca is sometimes supplied by the largeness and convolutions of the colon; to which gut the ileum cannot, when it enters laterally, so easily communicate its peristaltic motion. As the stomachs were the receptacles of the food when it entered, the cæca are receptacles of the fæcal matter before it be discharged. They are of various forms and capacities; they are often larger than the stomach itself; are often composed of proportionally thin and transparent membranes; and from their contents have often a colour somewhat resembling that of the gall bladder. Their number is different in different animals. Some have but one. The birds which have them have generally two; the bustard has three; and

Swammerdam has dissected insects which had four. As some stomachs have a number of folds which hang pendulous within their cavity, and increase their surface, so have often the cæca as well as some portions of the canal. The cæcum of both the rabbit and the hare is curiously formed. It is large and beautiful: it is rolled up like a cornu ammonis; it has the like outward appearance; and a fold running spirally is observed within. The animals which live on vegetable food have usually the greatest length of the canal, and the greatest number of stomachs and of cæca: yet the cassowary, which has no gizzard, has no cæcum; and the polype, which is said to be all stomach, is, properly speaking, rather all cæcum.

To see more fully the process of digestion, we must not overlook that general and organic action which takes place through the whole alimentary canal. The power of mastication exerted in the mouth is obvious to all. But the force of some stomachs has till very lately been known to few; we allude here to that of the muscular or gizzard kind: for Abbé Spallanzani has divided stomachs into three sorts; the muscular, the membranous, and intermediate. The immortal Borelli, who was probably the first that tried the force of the muscular stomachs by throwing into them nuts of filberds, hollow spheres of glass, hollow cubes of lead, small pyramids of wood, and several other very hard substances, supposed that the power exerted by the stomach of the Indian cock was equal to 1350 pounds weight. The force of an intermediate stomach cannot be so great, and that of a membranous one must be still less. Each seems to have more of the solvent as it has less of the muscular power. The most membranous are assisted by the action of the neighbouring parts, and expel their contents as readily as the strongest. The muscular sort is either wholly or principally confined to certain kinds of birds and of fishes, as nature has meant that the grain or the shells which they use as food should be first triturated before it be subjected to the gastric juice. This comminution takes place in their stomach, because it is plain that, had bones or muscles, fully equal to all these effects, being placed in the head, the form of the animal must have been altered, or that equilibrium which it preserves in those fluid elements through which it moves been completely overturned.

As to the movements of the alimentary canal, the direction of hairs found in the stomachs, and the balls of hair which are thrown up, would appear to indicate a circular motion. The intestinal part has a motion similar to that of a worm, and is called the vermicular or peristaltic. Here every portion retains its own motion, although it be separated from the rest by ligatures. The stomach of the polype, the gullets of the ruminating kinds, and the cæca, have this motion in different directions at different times; and that observed in the alimentary canal of a louse is, when viewed through a microscope in the time of action, amazingly rapid; the stimulating causes employed are the food, the different liquors with which it is mixed, the air, the nerves where they exist, and a portion of heat. Some degree of heat is necessary to every process of digestion both in the animal and vegetable kingdom: what that degree is depends on the nature of the living body; and is various according to its age, its health, its employments, and habits. The ingenious Hunter has mentioned the digestive and generative heats; and those gardeners who are versant in the ope-

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rations of hot-houses, have on their thermometers the swelling, flowering, and the ripening beats, with a great many others, for the several plants which they mean to raise.

Among the other causes of digestion some authors have ranked fermentation: and it must be allowed, that something similar to the putrefactive fermentation takes place in the cœca and the lower extremity of the intestine, and that the vinous and acetous fermentations but too frequently occur in our stomach when that viscus is morbidly affected.

Much of the history of living bodies relates to the different degrees of heat, the varieties of soil, and the kinds of food concerned in digestion. The plants grow where the soil and the heat are congenial to their nature; and those which admit of the greatest variety with respect to soil, and the largest range on the scale of heat, are the farthest dispersed over the globe. As every soil has usually some regular supply of moisture, the plants that can live upon that supply extend their roots under the surface where their liquid food is the least exposed to evaporation, and meeting there with the constant nourishment which they require, they remain in that situation for life. If their trunks be so feeble as to need a support, they creep on the ground, they climb the face of a neighbouring rock, or cling to the body of some of the statelier children of the forest. Their range for food is extremely limited: it is chiefly confined to the small space which happens to be occupied by their roots and branches; yet if any uncommon exertion be necessary, the branches will bend, and the leaves turn to drink of the water that is passing by. If the roots be laid bare, they will again plunge into the earth; if a stone or a ditch be thrown in the way, they will move round or will dip downwards, and spread into the soil on the other side: if there they arrive at one that is unfriendly, they will not enter; but if a favourite earth should be near, though not in their direction, they will twist about, advance as they grow, and at last meet it. In all these cases the prop, the water, and soil, must be necessary; they must also be within a very small distance, otherwise the plants cannot perceive them, or will fail in their languid attempts to approach them.

It may be considered as a general fact, that wherever food is liberally supplied for a whole lifetime in one place, the creatures which use it have seldom much locomotive power, or much inclination to exercise it in a long continued and progressive line. The curious insect is therefore observed to deposit its offspring in those places where the prospect of genial warmth and of plenty seems to preclude the future necessity of wandering or research; and when this offspring is about to pass into a new state, and the organs foretell that a change or perhaps a variety of food will soon be required, the appearance either of wings or of legs does likewise foreshow that the power of locomotion is to be increased. Even nobler animals in their foetal state, where they live upon one species of food, and where that is afforded in regular plenty, do spread out their roots, adhere to their soil, and become as stationary as the plant itself; and even when that supply is withdrawn, and they are expelled; yet if the state into which they immerge be helpless and feeble; if their organs of digestion have a weak solvent or masticating power, particularly adapted to some easily assimilated food; and if that food be presented either by their parent or nature with-

out their exertion, their power of locomotion is not great, nor is it exercised in wandering afar. It is when the organs of digestion are strong, and the appetite inclines to variety of aliment, that they are disposed and feel themselves able to wander in search of it; and that then they may be ready to move at intervals from place to place, when the enemy comes or the spirit prompts them, nature has directed them to solid food, and has given them a large alimentary canal with stomachs, with convolutions, and cœca, where they may lay up provisions for a journey; but, afraid to entrust them with too much freedom, lest in their excursions they might wander from the places where subsistence is found, there are two appetites, hunger and thirst, which never fail in a state of health to remind them of their duty.

This variety of food, and the manner in which it is affected by climate, are the cause of the many and singular migrations from spot to spot, from country to country, and from sea to sea: they are the cause of a state of torpor in the hedge-hog and the bear, and they partly explain the provident foresight of the ant and of the bee. Animals of great locomotive power, in order to provide for themselves and their offspring, remove to a distant country or climate when they see the signs of approaching famine. Those of less locomotive power, and who are incapable of migrating far, as if warned by heaven, lay up a store for the scarcity to come; or, should their food be of that kind as not to be easily preserved for a season, they receive no secret warning to hoard it at the time when it fails, their system becomes susceptible of torpor, and they are enabled to sleep through the storm of trouble and of want. The source of this want is in most instances to be traced to the nature of the plant and insect. The plant which has little heat of its own depends on the sun, or some other agent, for one of the great causes of digestion. When this agent refuses the necessary heat, the plant must decline; its leaves, its juices, and its fruits must fail. The insect tribe, which had no other food, or which like the plant could not maintain their vivifying warmth, must likewise submit to the same fate. The various animals which live on either the one or the other, according to their several dispositions and characters, retire to their stores, to their dens of torpor, or migrate to a country to which they are led by unseen guides to share in its abundance. Of these last the rail and the swallow are the only two which are sometimes arrested, and which, with the bear, the hedge-hog, and the toad, are obliged to remain in the dwellings of torpor till the genial season of warmth and of plenty.

GENUS II.—*Absorption.*

When the food has undergone the first preparation, which is called digestion, and the chyle is formed in the alimentary canal or sap-vessels, it is thence taken up by means of absorption for the use of the system. From the vessels it passes into the whole cellular tissue, composed of vesicles, and closely interwoven with all the vascular part of the plant. From the vesicles or utricles of the cellular tissue it enters the vasa propria and glands, which contain and prepare the fluids and secretions peculiar to the species.

In the animal economy it was always supposed that the chyle was absorbed by the ramifications of the red veins spreading on the gut, till the year 1622, when Asellius an Italian discovered the lacteals running on the mesentery of a living dog,

and printed his account of them in 1627. As he had not traced their course very far, he naturally thought that they went to the liver, which was then imagined to be the organ of sanguification. This opinion, with respect to the place where they entered the veins, continued to be general till 1651, when Pecquet in France published his account of the thoracic duct. With great candour this author acknowledged, that he had been led to make the discovery by observing a whitish fluid mixed with the blood in the right auricle of the heart of a dog, which kind of animal it had been customary to dissect alive since the time of Asellius. "This practice of opening living animals furnished likewise occasions (says Dr. Hunter) of discovering the lymphatics. This good fortune fell to the lot of Rudbec first, a young Swedish anatomist, and then to Thomas Bartholine, a Danish anatomist, who was the first who appeared in print upon the lymphatics. His book came out in 1653, that is, two years after that of Pecquet; and then it was evident that they had been seen before by Dr. Highmore and others, who had mistaken them for lacteals; but (adds Dr. Hunter) none of the anatomists of those times could make out the origin of the lymphatics, and none of the physiologists could give a satisfactory account of their use." He had not known that Glisson, who wrote in 1654, has ascribed to these vessels the office of carrying the lubricating lymph from the several cavities back into the blood; and that Frederick Hoffman has expressed the doctrine of their being absorbents very explicitly.

It was on the 19th of June 1664, that Swammerdam discovered the valves of these vessels; and Ruysch, who had seen them, perhaps very nearly about that time, first gave an account of them in a small treatise which he published at the Hague in 1665.

The best mode of demonstrating the lymphatics we probably owe to the celebrated Nuck, who, as a specimen of that complete System of Lymphography which he meant to publish, printed in 1691 his *Adenography, or Description of the Glands*. In this treatise he not only tells us how he brought them into view, but in his plates represents many of them as filled with his new mercurial injections; a happy invention, which perhaps was suggested by remarking the extreme subtilty of mercury when employed in the cure of venereal infection.

A method by which he inflated these vessels led him to suppose that they took their origin from veins or arteries, either immediately or through the intervention of some follicles. The celebrity of his name procured credit to this mistake; and notwithstanding the sounder opinion of Glisson, of Hoffman, and some others, the old notion that the veins performed the office of absorbents came so far down as the great names of Haller and of Meckel. The arguments, however, by which it was supported are shown now, and particularly by those of the Hunterian school, to have been injections that were not skilful, observations that were not accurate, and conclusions that were not logical; while the boasted assertion that birds and fishes were without lacteals and without lymphatics, has been disproved by the fortunate discoveries of Mr. Hewson and Dr. Monro. Excepting, therefore, in the penis and placenta, and in those animals whose veins may be injected from the gravid uterus, the lymphatics seem to perform the whole business of absorption. They contain a fluid that is coagulable like the lymph of the

blood, and are called valvular to distinguish them from the arteries that do not admit the red globules. They derive their origin from the cellular membrane, from the different cavities, and from the surface. Some authors say that they have seen them in the brain, and these Mascagni has ventured even to describe in prints. That some indeed may exist in the brain, has not been denied: but to believe that they have been found, and to trust assertions which are not countenanced by the observations of skilful anatomists, requires a faith which for our part we do not pretend to. Both they and the lacteals derive their name from the colour of the fluids which they contain. They both empty themselves into the veins; but most of the lymphatics in the human subject, and all the lacteals, first unite in the thoracic duct, which near the heart leads into the course of the circulation.

GENUS III.—Circulation.

After part of the food is converted into chyle, and this chyle absorbed by the lacteals, and brought into the course of the circulation, it remains to be distributed to all the different parts of the system. On this account Hippocrates speaks of the usual and constant motion of the blood, of the veins and arteries as the fountains of human nature, as the rivers that water the whole body, and which if they be dried up man dies. He says that the blood-vessels are for this reason every where dispersed through the whole body; that they give spirits, moisture, and motion; that they all spring from one; and that this one has no beginning and no end, for where there is a circle there is no beginning. In such language was the prince of physicians accustomed to express his vague ideas of a circulation; for, so far was he from having acquired accurate conceptions on this subject, that, when he saw the motions of the heart, he believed that the auricles were two bellowses to draw in air, and to ventilate the blood.

When after his time anatomy came to be more studied, the notions of the ancients respecting the blood were better defined; and, however chimerical they may seem to us, they were partly derived from dissection and experiment. On opening dead bodies, they found, that the arteries were almost empty, and that very nearly the whole of the blood was collected in the veins, and in the right auricle and ventricle of the heart. They therefore concluded that the right ventricle was a sort of laboratory; that it attracted the blood from the cavæ; by some operation rendered it fit for the purpose of nutrition, and then returned it by the way that it came. From the almost empty state of the arteries, they were led to suppose that the right ventricle prepared air, and that this air was conveyed by the arteries to temper the heat of the several parts to which the branches of the veins were distributed.

To this last notion entertained by Erasistratus, Galen added an important discovery. By certain experiments, he proved that the arteries contained blood as well as the veins. But this discovery was the occasion of some embarrassment. How was the blood to get from the right to the left ventricle? To solve the difficulty in which his new discovery had involved him, he supposed that the branches of the veins and arteries anastomosed; that when the blood was carried to the lungs by the pulmonary vein, it was partly prevented by the valves from returning; that therefore during the contraction of the thorax it passed through the

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small inosculating branches to the pulmonary vein, and was thence conveyed along with the air to the left ventricle to flow in the aorta. This opinion, so agreeable to fact, unfortunately afterwards gave place to another that was the result of mere speculation. This notion was, that the left ventricle received air by the pulmonary vein, and that all its blood was derived through pores in the septum of the heart.

The passage through the septum being once suggested, and happening to be more easily conceived than one through the lungs, it was generally supposed the only one for a number of centuries; and supported likewise, as it was thought, by Galen's authority, it was deemed blasphemy in the schools of medicine to talk of another. In 1543, however, Vesalius having published his immortal work upon the structure of the human body, and given his reasons in the sixth book why he ventured to dissent from Galen, he particularly showed how it was impossible that the blood could pass through the septum of the heart. His reason roused the attention of anatomists; and every one grew eager to discover the real passage which the blood must take in going from the right to the left ventricle. The discovery of this fell first to the lot of Michael Servetus, a Spanish physician, who published his opinion, and revived the old doctrine of Galen, in 1553. But his opinion did not spread at the time; the book in which it made its appearance contained heresy, and was therefore destroyed by public authority. Fortunately, however, the same discovery was again made by Realduus Columbus, professor of anatomy first at Padua, and afterwards at Rome, who printed his account of it in 1559. Many others who were engaged in the same research were equally successful, and Andreas Cæsalpinus, even singularly lucky. It appears by his *Peripatetic Questions* printed at Venice in 1571, and reprinted there with his *Medical Questions* in 1593, that he knew not only the lesser circulation, but had observed that there were times when the blood flowed from the branches of the veins towards their trunks, and that veins swelled between their ligature and the extremities, and not between the ligature and the heart. From these observations, he necessarily inferred that the veins and arteries anastomosed; and having also contemplated the nature of all the valves which were then known, and had been known since the days of Galen, he ventured to assert that the blood could not return by the arteries to the left ventricle. One should imagine that from such conclusions he must have discovered the true circulation; but he did not. Being a zealous Peripatetic, he thought himself bound to maintain with Aristotle that the blood flowed, like the tides of Euripus, backwards and forwards in the same channel; and therefore supposed that it flowed from the arteries into the veins in the time of sleep, and from the veins back into the arteries in the time of waking. The greater circulation, so far as we can learn, was not even dreamed of by this writer. A farther step was yet to be made towards its discovery; and this was reserved for another professor of the Paduan school.

In 1574, Hieronymus Fabricius ab Aquapendente, while he was seeking for a cause to explain the varicose swellings of some veins which had arisen from friction and ligature, he to his great joy and astonishment discovered their valves in one of his dissections: and here again the true theory of circulation seemed almost unavoidable. Yet whoever reads the small treatise *De Venerum*

Ostiolis, first printed by Fabricius in 1603, will soon perceive that he was as far from entertaining a just notion of the circulation as his predecessors. Notwithstanding all that he saw, he still was of opinion that the blood flowed from the heart to the extremities even in the veins. He thought that the valves were intended by nature only to check and moderate its force. He calls them an instance of admirable wisdom, and mistakes his own awkward conjecture for one of the designs of infinite intelligence. In another respect, it must be confessed that he bore no inconsiderable share in promoting the discovery of the circulation. By writing on the valves, the formation of the fœtus, and the chick in ovo, he directed the attention of his pupil Harvey to those subjects where it was likely that the motion of the blood would frequently occur.

Harvey was born at Folkstone in Kent, in 1578, completed his studies at the university of Cambridge, went to Padua, and was there admitted to the degree of doctor, with unusual marks of approbation, in 1602. He examined the valves with more accuracy than his master Fabricius; and explained their use in a treatise which he published some time after. It is uncertain when he first conceived his celebrated doctrine of the circulation; but about 1616 he taught it in his lectures, and printed it in 1628. He was the first author who spoke consistently of the motion of the blood, and who, unbiassed by the doctrine of the ancients, drew rational conclusions from his experiments and observations. His books present us with many indications of a great mind, acute discernment, unwearied application, original remark, bold enquiry, and a clear, forcible, and manly reasoning; and every one who considers the surprise which his doctrine occasioned among the anatomists of those days, the strong opposition that it met with from some, and those numerous and powerful prejudices which it had to encounter from the sanction of time and of great names, must allow it was new, and that the author has from its importance a title to rank in the first class of eminent discoverers, ancient or modern.

His discovery showed, that in most animals the blood circulates in arteries and veins, and through the medium of one, two, or of more hearts: that in arteries it moves from the trunk to the branches; and that, meeting there with the branches of veins, it returns in a languid stream to the heart; that the heart communicates a new impulse; that it drives it on to the trunk of the arteries; and that the arteries, by the thickness of their coats, exerting a force, do push it onwards again into the veins.

In every part of this circulating course, there are valves situated where it is necessary; they are meant to prevent the return of the blood; they are at the beginnings of the great arteries, and are found in different places of the veins where their feeble action requires to be assisted.

The veins, before they enter the heart, generally expand into a thin muscular sac, which is called the auricle. It receives the blood while the heart is contracting; and, when the heart admits of dilatation, contracts itself, and throws the blood into the ventricle.

We have here called the ventricle a heart: though what is usually meant by the heart be a ventricle and auricle; or sometimes a ventricle and two auricles, where the veins approach in different directions, and, without bending to meet one another, expand at two different places. Two

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hearts are sometimes united, so as in appearance to form but one.

From our having mentioned more than one heart, it will be supposed that the modes of circulation are various. In some animals the heart throws its blood to the remotest parts of the system; in other animals it throws its blood only into the respiratory organs: from these organs it is collected by the branches of veins; and these branches, uniting in a trunk, convey it to an artery, which renews the impulse, and acts as a heart. In a third set of animals, the blood from the respiratory organs is carried by the veins to another heart; and this second heart, united in the same capsule with the first, distributes the blood by the channel of its arteries to the several parts. In the human foetus, and the foetus of those animals which have two hearts, a part of the blood, without taking the passage through the lungs, proceeds directly from auricle to auricle. In amphibious animals, the auricular passage continues open during their life, and is employed, when the breathing ceases, under the water. In many insects, a number of hearts, or expansions which answer the purpose of hearts, are placed at intervals on the circulating course; and each renews the impulse of the former where the momentum of the blood fails. In the *Sepia Loligo* the two separate parts of the gills are each supplied by a heart of its own: the blood from both is collected into one; which by two arteries opening at two different parts, send it at once to the opposite extremities. In numbers of animals, the heart, like the stomach, is in the extremity opposite to the head.

After the discovery of the circulation, the most interesting object with anatomists was to demonstrate it in a clear, satisfactory, and easy manner. Harvey, to show it with every advantage that he could think of, was obliged to open animals alive; but whether the animals were dead or alive, the larger branches of the veins and arteries were only to be seen, and even these but in certain cases, when they happened occasionally to be full of blood. That admirable method, which is now observed in demonstrating the course of the circulation, we owe to the great anatomists of Holland who flourished in the last century. About 1664, Regnier de Graaf invented the syringe, which is now used; and, accompanied with a print, published an account of it in 1669. His injection was usually a thin fluid of a blue, green, or some other colour; this injection transuded through the vessels, allowed them to collapse by its general diffusion, and broke out through the first opening that happened in its way. A fluid which hardened after being injected, and which preserved the vessels distended, was a happier contrivance. This at first was either melted tallow or wax, of a colour suiting the taste of the anatomist. So early as the year 1667, the celebrated Swammerdam injected the vessels running on the uterus with ceraceous matter; and, jealous lest another should claim the merit of such an invention, he transmitted preparations, accompanied with plates, and with a full account of his method, to the Royal Society of London, in 1672. Soon after, his friend Ruysch acquired such skill in the art of injecting, that he has not been surpassed by any since his time. He discovered vessels in many parts where they were not supposed to have had an existence; and, contrary to the opinion of the great Malpighi, he showed that even many of the glands were entirely vascular; and that what had been supposed excretory ducts, deriving their origin from some follicle, were but termina-

tions of arteries continued: yet even Ruysch could not exhibit in all cases the course of the vessels so well as we do now. Another discovery was yet to be made for demonstrating their small capillary branches running through a part. This was reserved for the very ingenious Dr. Nicholls, of London; who invented the method of corroding the fleshy parts with a menstruum, and leaving the wax, as it was moulded by the vessels, entire.

From these researches, which evince circulation to be a function so general among animals, some are disposed to think it takes place in all living bodies. But notwithstanding the fashionable language of circulating fluids, of veins, arteries, and even of valves, in the vegetable structure; yet nothing performing the office of a heart, and nothing that seems to conduct fluids in a circular course, has been found in plants. In the vegetable kingdom, the chyle is distributed to all the parts from the numerous vessels which convey the sap; and these vessels, being fitted by their structure to carry the sap either downwards or upwards, from the branches to the roots, or from the roots to the branches, is the reason why plants inverted in the ground will send forth roots from the place of their branches. Even a similar distribution of the chyle takes place in some animals. In the human *tænia*, in the *fasciola hepatica* of sheep, and in most polypes, the chyle, without a circulating system, is conveyed directly to the different parts from the alimentary canal. The taste for circulation may at last subside. Till the business of absorption from the intestines was, of late, fully secured to the lacteals, we were wont to have also learned dissertations upon a circular motion of the bile. The jaunt which it took was not very cleanly; but it was social: it went with the faces down the intestines, and returned with the blood in the mesenteric veins.

GENUS IV.—Respiration.

This is one of the most curious as well as one of the most important functions of the animal economy: and it is at the same time one of those with which to this hour we are least acquainted as to its mode of action. It is that function by which atmospheric air is introduced into the frame and variously modified for particular purposes.

So essential is respiration to the system, that snails, chameleons, and some other animals, can live for years upon air alone. We have seen a chameleon that lived and was vigorous for twenty-two months without any food, and which might have continued to live much longer but for an unfortunate bruise by a fall.

Other phenomena equally demonstrate the importance of air to the living body. The frog leaps away wanting its heart; it survives the loss of the greatest part of its spinal marrow. Without its head, it lives for some days, and its heart continues to circulate its blood. Spallanzani took one from the back of a female, cut off his head, and, after performing this whimsical experiment, saw the gallant return to his mistress, grasp her in his arms, and finish the task which he had begun. And Borelli found, that eels and serpents, though their bodies be opened, and the whole of their viscera be taken out, are able to move for a day after; and yet notwithstanding, in all these animals, the life is observed to be suddenly extinguished when the all-vivifying air is excluded. Even the smallest insect has died, and the plant lost its vegetative power, when retained for any while in a vacuum. The fish itself, when placed under the

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Exhausted receiver has started anxiously to the surface of the water in quest of fresh air; and, finding none, has sunk to the bottom and expired in convulsions.

If objections should be made to these trials performed in a vacuum; if it should be said, that under the receiver the shrivelled fruit swells and turns plump, that the body of the frog is strangely inflated, that its turgid eyes grow prominent in its head, and that thin phials corked full of air are broke by its expansion; still there are facts which do not admit of the like equivocal interpretation. All living bodies will die in the air which they have respired; and when ice covers the whole of the water, many of the fishes are known to perish; or, if an opening be made in the ice, to hasten to the air, and, rather than retire, quietly suffer themselves to be caught.

The recent experiments of Mr. Brodie, upon this subject, are highly curious, and altogether pertinent to the present point. Animals pithed, or having the spinal marrow divided at its upper end, are well known to die as rapidly as if altogether decapitated; but if preparation be made at the time of being pithed for continuing an artificial respiration, by alternately inflating and exhausting the lungs by a small pair of bellows, the animal, instead of dying immediately, may be made to live several hours; and the action of the heart and the general pulsation of the arteries will continue with little interruption or diminution of strength: and the very same effects follow if the head be entirely taken off, provided the arteries leading to the head be properly secured. These experiments were repeated in a variety of instances, on dogs and rabbits, and with uniform results. The reader will find them detailed in the Phil. Trans. for 1811, forming the Croonian Lecture.

To this general dependence of life upon respiration there occur but few things like an exception; these are, some serpents and worms and crustaceous animals found alive in the hearts of stones, some insects that were found in wood, and a number of toads which in different places have been taken from the hearts of trees and of rocks, where they left an impression, and where they were supposed in some cases to have lived for centuries without air. These facts, real or pretended, have been the cause of much speculation. Some philosophers, who imagine that nature is always obliged to act agreeably to those ideas which they have already formed of her laws, are, notwithstanding the high authorities by which some of these facts are attested, disposed to doubt them. General analogy, which regularly opposes singular phenomena, is upon their side; and without her concurrence, they will grant existence to no living body that will not submit to the old established modes of respiration. Others, again, who would not presume to dictate for nature, who have long experienced that she is not forward to obtrude her secrets, and who can believe that she may have still some to communicate, consider these facts as something new which she means to impart; and as one of the instances where she seems to deviate from general analogy, in adhering to her grand accommodating principle, by which she fits every living body for a certain range of varying circumstances.

These last, receiving the facts as sufficiently authenticated, have studied only how to account for them. When stones therefore were thought coeval with the world itself, they supposed their

toads to have sprung from the ova that were scattered through the earth at its first formation; they did not recollect that if the earth must have existed before these ova could have been sown, and that if the stones were coeval with the earth, the ova could not have entered their substance. When they afterwards learned that the consolidation of stones is an operation still carried on in the mineral kingdom, they acknowledged their ova to be less ancient, but did not perceive that all these ova involved suppositions that cannot be admitted by sound reason. For, how was an ova to grow without air and without food? and how particularly was it to grow with such a force as to make an impression in a solid rock? This would imply a power of expansion scarcely to be equalled by gunpowder, and which we ought not to be rash in ascribing to the nutritive effects of abstinence and nothing. Were it not for the toad, the expansion itself might have found a solution in a theory of the earth, which has cast all its stones in a foundry under the water, where the moisture might have rendered them apt to be formed with numerous cavities.

Perhaps the way to remove these difficulties concerning the toad would be to ascertain its mode of existence in the heart of the stone. Suspecting that the air communicated somehow with the solitary cell, we procured a toad that was crawling out from its den in the evening. It was put into a glass just large enough to hold it with ease. The mouth of the glass was filled with cork sufficiently close to retain water; the glass was then laid on its side, and the animal respired for several days without discovering signs of uneasiness; but supposing that air might still be admitted, the cork received a covering of wax, and the animal died ten hours after.

But are we certain that the admission of external air would remove the difficulty? We are not so positive now as we were upon this subject. In the summer months we recollect to have drowned frogs which were living in the fields, by keeping them some hours under water; but if we allowed them to rise to the surface, and to respire at pleasure, they became at last so accustomed to that element, that, if the temperature was not much above that of spring-water, they lay in the bottom not only for days but for weeks together.

In the winter season, it is well known that frogs are sometimes discovered in clusters below stones and under water in the neighbourhood of springs; and often seen in the bottom of ponds, marshes, and ditches, where water is collected, and the whole surface covered with ice. In this situation, we have frequently examined their sides and their nostrils, and can venture to assert, that they did not respire in the same manner that they did when on land: for, the moment that this animal is put under water, the palpitating motions of its sides and its nostrils are observed to cease; and Chaptal has seen them suspending respiration as it were at pleasure even when in air.

While they move, however, and exhibit indications of active life, we would not say that air is excluded. In the roots of plants, in aquatic worms, in polypes, and in the placenta itself, the same organs seem to perform the double office of lungs and absorbents. When under water, what are the functions of these organs in frogs and in toads? It is not disputed that in moist places they can live longest without food; and some phenomena which have been observed relating to this

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subject appeared to us not unworthy of attention. In the beginning of the summer 1793, while we were making a few experiments on the nervous influence with some metals, a frog was taken out of the water in the dusk of the evening, and put into a deep and wide-mouthed glass till next morning: but next morning a quantity of water was found in the glass, the animal was dead, its mouth full of foam, and the greater part of its body covered with froth. The following autumn a boy came with a couple of toads wrapt up in tow. Till we had leisure to make our experiments, they were allowed to remain as they were for three days in the corner of a room. When taken out, their colour was pale, their bodies much swelled, and a quantity of water collected between the skin and the muscles. When held in the hand with their head upwards, the water was evacuated downwards by the anus. It was one of these toads that afterwards died when confined in the glass without air. Its body was put into a solution of madder for two days; and when the skin and muscles were removed, the bones, which are still preserved, were found red. A live frog in the same solution, though allowed to breathe, expired in a few hours. In three days its bones become of the red colour, but not so deep as that of the toad's. Another frog died in the solution; but the bones, from age or some other cause, did not receive the colour of the madder. In all cases the skins were found red.

As we know not how far the great accommodating principle of nature may be extended, perhaps the absorbents opening externally may in these animals sometimes supply the place of the lungs, as the lungs supplied the place of the gills which they used when tadpoles, and as the gills had formerly supplied the place of a placenta, or the primary absorbents, through which they derived their nourishment in ovo.

Those stones which inclose animals are known to be such as have gradually assumed the solid form, and those animals which have been inclosed are known to be such as in other cases have been subjected to the torpid state: but this state has not been examined with all the attention which it deserves. From this state, Bonnaterra says, in his introduction to Ereptology in the *Encyclopedie Methodique*, that it is impossible to rouse the animal by the loudest noise, the rudest shock, or the deepest wound; the internal motion is just sufficient to preserve the system from that decomposition to which animal substances are exposed. It retains only the form of what it was. It appears neither to live nor to grow; and the whole mass, if what is exposed to the air be excepted, is not sensibly altered while the torpor continues. All the senses are shut up; all their functions are entirely suspended; digestion is no longer in the stomach; all respiration has apparently ceased; and it has been doubted whether or not this function be in some cases at all retained. When the genial warmth, however, returns, in six, in eight, or in ten months, according to that variety of climates between the frigid poles and the tropics, the animal revives. But the question is, if the first circumstances in which the animal became torpid had been artificially or naturally continued, how long in this way might the different functions of life have been suspended; and how far are we warranted by the analogy of seeds and of eggs to lengthen this period of their existence, without supposing a decomposition or destruction of organs?

Experiments must tell what are the limits which nature has here prescribed to herself. New eggs, when covered with varnish, or placed under the exhausted receiver, are secured against the attacks of corruption. Bomare, in his Dictionary, has mentioned three, which protected from air, were found fresh in the wall of a church after a period of 300 years. And if it be true that a snake found in a block of marble died as soon as exposed to the air, or if the parts in contact with air be the only ones which in torpid animals appear to be changed, it would seem probable that a total exclusion of this varying and active element would tend more to the preservation of torpid animals, in certain instances, than a free admission, which, in those cases where all vital functions have ceased, is regularly found a principal agent in their dissolution.

M. Herissant of the French Academy was the first philosopher who, by means of experiment, thought of interrogating Nature herself upon this subject. On the 21st of Feb. 1771, he with great accuracy shut up three toads from the air, two of which were taken out alive on the 8th of April 1774. Daubenton says, after a period of 18 months; but in this instance we depend more on the friend of Fontana, who has mentioned the dates. The two toads were again enclosed, and Herissant died before there was a second inspection. Daubenton says, that when taken out their bodies were hard and shrivelled, and their whole moisture totally absorbed. A fourth toad that had been inclosed was heard to croak whenever the box in which it was confined happened to be shaken. Since that period the practice is common of confining snails in a sealed phial, where they exist in torpor for years.

These phenomena still excite wonder; but to wonder less, and examine more, would sooner procure us that information which we are wanting. In these observations concerning toads, have no circumstances been overlooked? Has it been determined whether they lived in the heart of stones, or, existing merely in a torpid state, had come alive when exposed to air? We have seen a toad that was dead for two days; its body was opened; its heart was seen motionless; but, exposed to air, in a few seconds it began to beat. Considering the complex function of absorbents, we perhaps might conceive how a toad could live in the clefts of rocks, or the hearts of trees, where there is moisture; but has it yet been determined whether all stones in which toads have been found supplied them with moisture? We at least are certain that they did not absorb the animal fluids, like the plaster used by the French academicians.

One of the toads was heard to croak after being inclosed. In making their experiments, has it, therefore, been thought a matter of indifference by the French philosophers, whether the animal was immured alive in the full exercise of all its functions; or existing only in its torpid state? And with respect to this singular state, (might not the questions be fairly put?) have its several kinds, have the causes which induce it, or those degrees to which it may be carried in different animals, been yet ascertained? Is not our knowledge of the torpid state at this moment principally the result of casual observation? Has it not been oftener than once supposed that the torpor of all animals is similar, or takes place to a similar degree? Have not torpid animals been therefore spoken of in general terms? and has it not been asserted that they retain a portion of heat and internal motion?

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though some have been found congealed in the ice, and many been dried to such a degree that they could be revived only by moisture.

"That snakes and fishes, after being frozen, have still retained so much of life as when thawed to resume their vital functions, is a fact," says Mr. Hunter, "so well attested, that we are bound to believe it." How came it, we would ask, that fishes which had been frozen by this truly ingenious physiologist never recovered? He recovered parts of different animals which had been frozen. Had the snakes and fishes of which he had heard been only partially congealed in the ice? or had the fishes which he selected for these experiments been properly chosen? or may all animals with equal fairness be made the subject of such experiments? and may all transitions from heat to cold, and from cold to heat, whether slow or rapid, if not in the extremes, be viewed as nearly of the same consequence? Are all seasons and conditions of body equally favourable to this state of torpor? and will these causes which induce torpor by operating externally in the months of autumn be able to continue it by the like action in the months of spring? We can answer, No.

It has been said that animals subsist in their torpid state by the reabsorption of fat. Has it therefore been proved that all animals, not to say living bodies, are possessed of fat? or, if they be, has it been demonstrated that they have a superfluous quantity to be reabsorbed? Has it been shown that their waste of fat is always occasioned by this reabsorption? or has this reabsorption in all cases been of that kind to counteract the effects of abstinence? If it has not been proved that all animals contain fat, and that this fat is reabsorbed in their torpid state, ought not the general assertion to be limited? Granting that in many respects it were true, have not philosophers been here amusing themselves with logic, where they could have been employed in making experiments? Have they not ventured to give us conclusions, where we had reason to expect facts? And, on this account, has not their conduct been somewhat similar to that of navigators, who, sailing along the coast of Patagonia on one side, and observing a few men of an uncommon stature, have from thence peopled the whole of the country with a race of giants? or rather to that of some calculators, who, from seeing a few parts of a continent, have ventured to give a map of the whole, to describe kingdoms that are yet unexplored; and, by their skill in addition and subtraction, to exhibit the figure, the extent, and proportion of lands unknown?

Leaving therefore the torpid state as one of those subjects with which we at present are little acquainted, and of which we therefore cannot speak with certainty in the general abstract language of science; it will naturally be asked, in what respect is air so necessary to all living bodies in their active state, and how contributes it to the regular performance of the different functions?

The ancients, who were led by the heat of the blood to suppose a vital spark in the heart, who had noticed the appearance of smoke in the breath, and who had observed that fire was extinguished when deprived of air, naturally inferred that the end of respiration was to support their imaginary flame, to ventilate the blood in the arteries and lungs, and to keep alive their vivifying spark. They were far, however, from being agreed as to the manner how this was effected. Some were of opinion that a certain principle of the air was absorbed, to which they gave the name of the pro-

vender of life, or the food of the spirit; while others were persuaded that the air acted as a refrigeratory, and was merely intended to moderate the fire, to assist in expelling the fuliginous vapour, and preserve the system in an equal temperature.

The moderns, who, after all their researches, have been unable to discover this vital spark of the ancients, are more puzzled to assign an adequate cause for the heat than for any cold which they discover. To account for this singular phenomenon, they have been ransacking nature for causes; and, perceiving that putrescence, mixture, and friction, are in many instances accompanied with heat, have thence conjectured that they sometimes operate in producing the warmth of the living body. But these are theories which have been imported from the hot-bed, the laboratory, and mechanic's shop, and which have never yet been countenanced by physiological facts and observations. No one has been able to show that putrescence exists in a healthy state, except in the faeces: no one has proved that any mixture which regularly occurs in the alimentary canal or vessels, generates heat; and though friction has been a favourite hypothesis, yet those circumstances, in which it evidently produces heat, have not been discovered in the living body; and it is not determined whether it be there a friction of the fluids, a friction of the solids, or a friction of the fluids and solids together.

Of animal heat the most rational theory, we think, is one which properly belongs to the last century; it is confirmed by modern discoveries, and ascribes this heat to respiration. Many had observed, that those animals which respire most have the warmest blood. Lower demonstrated, that this blood received a new and a brighter colour in passing through the lungs. Verheyen and Borelli both proved, that the air lost something by coming in contact with that organ. Mayow showed, that this something which the air loses is contained in nitre. Experience taught the workers in nitre, that this something was absorbed from the air: and Verheyen remarked, that it is also absorbed by the lungs; and is probably that which maintains combustion, which qualifies the air for giving support to animal life, and imparts to the blood the vermilion colour.

How well the whole of this reasoning was founded, is proved by the late discoveries of Priestley and other chemists. There is now obtained, in a separate state, an aerial fluid, which maintains both life and combustion, and gives a vermilion colour to the blood. It is extracted in a very large quantity from nitre; is one of the component parts of the atmosphere, and the vital principle of that element; without which, in most animals, life is extinguished. From some phenomena which happen in combustion, it has been termed principium sordile. It was called dephlogisticated air by Priestley, the first discoverer: as the great acidifying cause in nature, the French nomenclature has given it the name of oxygenous gas; and, as one of the causes on which the existence both of fire and of life depends, it is named empyreal or vital air.

Late discoveries have shown farther, how this air may in respiration produce heat. From the most accurate investigations, it appears that caloric, or the principle of heat, is a distinct substance in nature; that it combines with different bodies in different degrees; that it is the cause of fluidity in all; and that, in proportion to that capa-

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city which they have for it, and to that distance at which they are removed from the fluid state, the more or less caloric they contain. Aeriform bodies being all therefore exceedingly fluid, it must be evident, that when they are fixed or condensed in the blood, and made to approach nearer solidity, a quantity of heat must be evolved. A part of this is very plainly evolved in the lungs where the air is absorbed, as appears by the breath; and a part evolved by the action of vessels, as appears from nearly an equal heat over the system, from the partial heat of a morbid part, and the sudden transition from heat to cold, and from cold to heat, over the surface, when the vessels are affected by either internal or external stimuli. When the heat, thus evolved by the gradual fixation of that body with which it was combined, has been successful in making its escape by the lungs and integuments, the blood returns in a dark and a sluggish stream by the veins, and mingles again with the genial fluid, which before gave it spring, activity, and life.

Of that oxygen which remains in the system part is employed in forming different saline combinations and supplying the waste occasioned by that constant reabsorption; which, from many experiments that have been made with solutions of matter, is known to take place in the solid bones. The use of that oxygenous gas which returns with the breath, is best understood after knowing its affinities. Its basis oxygen, combining with hydrogen, which is the basis of inflammable air, forms water; and, combining with carbon, the carbonic acid. It carries, therefore, back with the breath a part of the carbon produced by the slight combustion of the blood, and a quantity of hydrogen arising from the watery fluid decomposed.

But oxygenous gas does not alone enter the lungs. Of 100 parts of the atmosphere, but 28 are oxygenous gas, $\frac{100}{300}$ is carbonic acid, and 72 are azotic gas. These last, though intended chiefly for other beings different from man, which are in immense numbers on the globe, but which, like him and the nobler animals, are not formed to breathe the empyreal air, must notwithstanding be of some important and essential use to all living bodies. It has accordingly been found by experiment, that pure and unmixed oxygenous gas cannot be breathed for any very considerable time without danger; that some azote is contained in the blood, and has been extracted from the muscular fibre, when properly treated with the nitric acid. According to Berthollet, five of its parts with one of hydrogen form ammonia, or volatile alkali; which dispels the glandular tumours of the body, and prevents the coagulation of blood and the thickening of mucus which arise from acids. The azotic gas may therefore in part unite with hydrogen, may prevent the coagulation of serum, the catarrhus formation of viscid mucus, and many combinations that oxygen might form, injurious to the system. The carbonic acid, which is $\frac{28}{100}$ of carbon and $\frac{32}{100}$ of oxygen, may also be necessary in regulating the effects of the other two. In aerated water, its uses are very generally known: it allays the pain of the urinary bladder when excited by calculus; it has been employed in the cure of wounds, and been thought useful in the pulmonary phthisis. It is generated in the lungs of those animals which respire oxygen. In small proportions it favours the growth of the vegetable tribes. These tribes readily decompose it; and, with the addition of other prepared oxygen from water, restore what

is pure to the general mass of the vital fluid, that plants and animals might thus live by the mutual performance of kind offices.

We return again to animal heat. Every theory that pretends to account for animal heat, ought also to account for that singular equality of heat which the system preserves, or endeavours to preserve, in different temperatures. The above theory explains it simply in the following manner.

Venous blood, if exposed to the air, is known to absorb a portion of oxygen, and assume that colour which it has in the pulmonary veins and aorta. Suppose an absorption of a similar kind taking place in the lungs, a fact which may be proved by decisive experiments; it is plain that the oxygen by this absorption must recede from its gaseous or fluid state; that a quantity of heat must be therefore evolved, which, along with the heat of the reffluent blood, is carried away by that vapour which issues from the lungs. In the course of circulation, the oxygen will naturally incline with hydrogen to form water; it will tend likewise to the formation of many other compounds; and, as it enters into new states, and is farther removed from gaseous fluidity, it must still be giving out a portion of heat. If the surrounding temperature be cold, this separation will be easily effected. The caloric will, in that case, be greedily absorbed from the interior surface of the lungs and exterior surface of the whole body. The oxygen, meeting with the necessary temperature, will readily pass into new forms; and the venous blood, returning to the lungs, will demand a supply which will be either greater or less according as the cold, by favouring the escape of the caloric, and promoting new combinations with oxygen, had removed it from the point of usual saturation.

The gradual evolution of heat is a proof that the temperature must be sometimes reduced before the oxygen can properly enter into all the usual combinations of the system. Suppose the body then to be placed within a hot circumambient atmosphere. This atmosphere, if warmer than the animal, will be more apt to part with heat than to receive it; and the oxygen absorbed, being thus unable to dispose of its caloric, will be prevented from passing into those combinations and forms where heat is evolved. The venous blood will therefore conduct it back to the lungs, and make a demand for a new supply; but proportionally less according as the hot circumambient air, by preventing the escape of the caloric, and the usual facility of new combinations, has confined its removal to a smaller distance from the point of saturation.

In this last case the thing principally entitled to notice is a very curious effort of nature to resist the growing increase of heat. In the warm atmosphere, as during violent muscular exertion, the exhaling vapour is commonly discharged in a greater quantity from the surface of the body; and consequently the heat furnished with an excellent temporary conductor, that in some measure counteracts the dangerous effects from without.

After all, the reader is not to suppose that he here has received a general theory of respiration. All living bodies are not supported by the same kind of aerial food. Oxygenous gas has indeed been honoured with the flattering appellation of vital air; and nitrogenous gas been usually distinguished by that degrading epithet azotic; a word which signifies destructive of life. But though man, and all the warm-blooded animals that have yet been examined, may die in respiring

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the nitrogenous gass, this gass, however, which constitutes more than two-thirds of the whole atmosphere, may in general be called the vital air of the vegetable tribes, and of not a few of the orders of insects which thrive and live in it. For while man, and others which respire as he does, emit both the hydrogen and carbon, and return the nitrogen not sensibly diminished; most vegetables and many insects eagerly inhale them, and emit oxygen as noxious or useless. These effects are the indications of a radical difference in constitution. Even the fibres of those living bodies which exhale oxygen, will, after death, attract it so powerfully, as to decompose the nitric acid; but those bodies which inhale nitrogen have so very weak an affinity to oxygen, and so strong a one to some of the bodies with which it is combined, that they can easily decompose water and carbonated air.

What fishes respire is not ascertained. Neither the change of the air, nor of the water which they occasion when in close vessels, have, so far as we know, been fully examined. Chaptal is assured, that, like other animals, they are sensible of the action of all gasses. Fourcroy says, that they do not generate the carbonic acid; and that the air which Priestley and he found in the air vesicles of carp was nitrogen gass. Their thermometrical heat is so low, that in Daubenton's table they are reckoned among the cold-blooded animals.

The temperature of plants is still lower. The heat of a tree which the very ingenious Hunter examined, though several degrees above that of the atmosphere when below the 56th division of Fahrenheit, was always several degrees below it when the weather was warm. When taken out, the sap was observed to freeze at 32°, while in the tree it would not freeze below 47°. The very profuse perspiration of vegetables greatly moderates the heat in their surface; and as air which absorbs moisture expands, and becomes thereby specifically lighter, there is a regular current produced, and evaporation rapidly promoted by the dense air displacing the rarefied.

To adopt here a general language with respect to the heat which is developed in all living bodies, it is proportioned to the quantity of matter which is by means of the vital powers reduced to a state more nearly approaching solidity; to the kinds of the substances which are reduced, and to the degrees and kinds of the reduction.

In all living bodies there appear to be certain degrees of heat, peculiarly fitted for carrying on their various economical operations. What these are, in the different kinds of plants and animals, is not known. The bear, the hedge-hog, the dormouse, and the bat, may probably not digest when reduced to 70°, 75°, or 80°. The frog, however, will digest at 60°; and the birch before it arrives at 47°. It would seem that respiration, besides imparting aerial food, was intended to preserve and regulate these different degrees of heat. It raises the heat after a meal; it suffers it to fall in the time of sleep; it withdraws the supply when the atmosphere is warm, and increases it again when the atmosphere is cold. It should therefore be remembered, that heat merely is not the object which is solely aimed at in respiration. All living bodies have their congenial degrees of heat. The regulation of these is important: on the one side, it prevents the dissipation, on the other the coagulation, of their fluids; it preserves the living power of their organs; and, by a natural and proper temperature, assists their action in mixing, composing, in decomposing, and in variously pre-

paring the different parts for secretion, excretion, absorption, reabsorption, and assimilation.

As various fixations of the vascular fluid are regularly taking place in the different parts of the living body, and as air is not the only fluid concerned, it would almost be unnecessary again to observe, that the whole of the heat is not evolved in the lungs, nor the whole that is evolved disengaged from air.

It may farther be remarked, that the whole of the air does not enter by the lungs; much is contained in the liquid and solid parts of the food. It is extricated often in the process of digestion; and when the organs are vigorous and healthy, is made subservient to the general economy. If the organs, however, should happen to be languid, it scorns their authority, which cannot be enforced; from being friendly, it soon becomes inimical to the system, and, threatening danger, accumulates not only in the stomach and intestines, but in other cavities. It has been found in the cellular membrane; in certain vesicles formed for itself; in the uterus; in an abscess; and in gun-shot wounds: it has sometimes burst from the vagina with a sort of noise. And in a nephritic complaint of a horse, we have observed it flowing in a stream from what the farriers denote the sheath.

In some kinds of aquatic plants, in eggs, and in a variety of fishes, there are certain vesicles containing air, which seem to have certain necessary functions allotted them by nature. In the plants and in fishes they were once supposed to have been wholly intended for swimming. It was remarked, that those fishes which remain constantly at the bottom of the water have no air-vesicle; and that a fish whose vesicle was burst by means of the Torricellian vacuum, though it lived for a whole month after in a pond, was never able to rise to the surface. The practice, however, which some fishes have of ascending at times to inhale air, and descending after their vesicle is filled; the communication which, in some fishes, this air-vesicle has with the stomach; that power in the pigeon and some other birds of introducing air into the crop; and lastly, the air which is uniformly found in impregnated eggs—would tempt us to believe that these natural collections of air, with their other uses, may perform some essential service in nutrition.

Having explained the general intention of respiration, we are now to inquire, what are the kinds of respiratory organs, and in what manner their functions are performed? The preceding table has in some measure made us acquainted with this subject. Some animals breathe by a trachæ and lungs; insects, by either stigmata or trachæ, opening into air-vessels; plants, by air-vessels and leaves; fishes, and numbers of the watery element, if they do not breathe, at least receive air by the gills; the fœtus in ovo, the polypus tribe, and many more organized bodies, by the same organs which convey their food.

The absorbents appear to be the first and most general way by which living bodies are supplied with air: the mouths of these vessels are like small tubercles, scattered over the body of the insect while wrapt in its membrane. In the horse and the bird they are blood-vessels spreading on a membrane, and deriving nourishment from the uterus or egg, that had been itself nourished by absorbents. In a cow, they are vessels which, spreading on a membrane, terminate in glands; these glands being opposite to others which adhere to the uterus; and the membranous and uterine glands,

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when in contact, inclosing a third gland like a kernel. In man, they are vessels spreading on a membrane, and entering a large glandular body called the placenta. In the mouse and the hare, they are likewise vessels branching on a membrane, and entering a placenta: this placenta, when it happens to be fixed, receives large veins from the parent, and which may be either inflated or injected from the cavity of the uterus.

Those which are properly respiratory organs exercise not their function till circulation and nutrition are begun: though, if the observation of Garman be just, that the air may become a real food for the class of spiders; or if it be true that the larvæ of ants, as well as of several insects of prey, increase in bulk, and undergo their metamorphoses without any other nourishment than air, this law is not universal. It may, however, be doubted, whether some moisture be not adsorbed. With regard to the ant, we have reason to suspect that the observations on which such a conclusion was founded have not been accurate.

Not only are the respiratory organs thus late in exercising their functions; in many vegetables a great part of them is annually renewed, and laid aside in the torpid state. In those insects which undergo the most remarkable kinds of transformation they suffer a change; and in all those animals which spend their earlier days in the water, and afterwards come to live in the air, they are altered in kind.

In all living bodies the proper function of one part of the respiratory organs is, to secrete from the water or air that particular aeriform fluid which mingles with their juices, and which is necessary to life and nutrition. In many cases these organs are placed externally, and are always in contact with the air or water from which they secrete. In other cases they are lodged internally; and air or water are then alternately admitted and expelled by varieties of organs which serve as auxiliaries.

The plants secrete their aeriform fluid from water and air. They receive air along with the liquids of their absorbents, which open on the roots, the trunk, and the branches, and upon the inferior surfaces of leaves; or if nature has plunged these leaves under water, the absorbents open and imbibe their fluids on both sides. In many, however, the upper surface of the leaf is intended to inhale air. Bonnet observed, that when this surface was applied to the water the leaf died soon; but that when the lower surface was applied, it lived for months. It has also been remarked, that the upper surfaces of some leaves will repel water; and that the death of the leaf will ensue when its breathing pores are obstructed with oil. We hence learn why aquatic plants rise up to the surface of the water and spread their leaves in the open air: and as it is proved by Ingenhousz and others, that the respiration of many leaves is assisted by light, we see a reason why plants growing in a dark room turn to the place where light is admitted; why the flowers and the leaves of many plants follow the diurnal course of the sun; why the branches of trees, which require much light, die when placed in a thick shade; why moonshine in autumn contributes so much to the ripening of grain; and why leaves and branches are arranged in such a manner as least to intercept that quantity of light which nature has allotted to the genius of each.

The respiratory organs, which are similar either to the gills of fishes or the lungs of man, can hardly here claim a description, as their nature and forms are so generally known. There is one

circumstance, however, in birds which arrests our attention; the cells of their bones, and the numerous vesicles of their soft parts which communicate with the lungs, have been deservedly a matter of surprise to most physiologists. In accounting for their use, the ingenious Hunter supposed that they lessened the specific gravity and assisted flying; that being the circumstance which he thought most peculiar to birds. Learning afterwards that they were in the ostrich and not in the bat, he supposed that they were appendages to the lungs. In amphibious animals, in the snake, viper, and many others, he observed, that "the lungs are continued down through the whole belly in form of two bags, of which the upper part only can perform the office of respiration with any degree of effect, the lower having comparatively but few air-vessels." In these animals, the use of such a conformation of the lungs was to him evident. "It is in consequence of this structure," said he, "that they require to breathe less frequently than others." From this reasoning he naturally inferred, that the motion of flying might render the frequency of respiration inconvenient; and that a reservoir for air might therefore become singularly useful. The bat and the ostrich, however, are here as formidable objections as before. The bird respire frequently when at rest, and when it flies to our bosom from the hawk; that frequency seems to have been increased by what is a general and a common cause, an increased degree of muscular exertion. Had air-cells been intended merely to prevent the effects of a rapid motion on respiration, we might expect to see them in greyhounds and a number of quadrupeds, much more readily than in some birds whose flights are neither rapid nor long.

This great physiologist was not aware that the circumstance most peculiar to birds was not their act of flying, but their feathers, which contain a large quantity of air, and which require a regular supply, whether they soar on the wings of the eagle, or remain on the ground attending the ostrich.

Both in amphibious animal and birds, the air of the vesicles has passed the respiratory surface of the lungs. In the pulmonary tubes and vesicles of insects, it is only proceeding on its way to be respired. Would it be worth while to inquire whether vegetable substances, and those which are called corneous in animals, require a different preparation of air from what is the common preparation of lungs? whether hair grows best, or the cuticle thickest, over soft parts that are cellular and spongy? and whether the animals that bear horns have larger sinuses in the frontal bone of their cranium than others? From the general diffusion of air through the birds, and the situation of their vesicles beyond the lungs, it would appear that the pulmonary viscus in these animals does not respire or secrete air for the whole system; and we are certain, that in plants and insects, most parts respire the air for themselves, and that there is no particular part appointed to secrete air for the whole.

We here speak of respiratory organs, as those which secrete an aeriform fluid from water and air; but our language probably had been more accurate had we called them the organs in which an aeriform fluid is absorbed by their liquid contents, as these flow by, wholly or in part, in their course through the system. It was long denied that any absorption of the air took place from the pulmonary surface; and speculative reasoners had attempted to prove that

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no air could pass to the blood through the membranes of lungs, because air had refused upon some occasions to pass through pieces of wet leather that had been exposed to it for that purpose. Borelli, however, endeavoured to show how air in the lungs might mingle with the blood, and how some always disappeared in respiration. There are few doubts now entertained on this subject. Venous blood inclosed in a bladder by the celebrated Priestley discovered such an attraction for oxygen, that it absorbed the æriform fluid through all the coats of the resisting medium, exhibiting an instance and beautiful illustration of the chemical affinities which take place in this function.

GENUS V.—*Secretion.*

This is a function by which a part is separated from the whole, and generally with some change of its qualities. In the case of nutrition it is observed that all parts secrete for themselves; and that some few, as the lungs, the stomach, the vessels, and the nerves, officiate besides for the general use of the whole system. If all the ingesta were to remain and to be assimilated, the body would go on continually increasing. But living bodies are constantly in a state of waste and repair. In most animals part of the ingesta is carried off by evacuation, without having entered the mouths of the absorbents; part, which enters the absorbents and veins, is thrown off by exhaling arteries or the urinary passage: and experiments with madder prove that the lymphatics, besides originating from all the cavities and carrying back the lubricating fluids, do enter the substance of the hardest bones, and convey particles that had been assimilated back into the blood.

This office has not been generally ascribed to the absorbents; nor has it been very generally supposed that the blood receives the excrementitious matters of the system, and that one intention of the circulation was either to return them for re-assimilation, or to discharge them by exhaling vessels or by the kidneys. Decayed parts, however, are discovered in the fæces evacuated by the intestines, in the clouds, the sediment, and colour of the urine, and by the smell of the perspirable matter. The two last, on certain occasions, and for some time, have often supplied the place of one another; and all the three, the fæces, the urine, and perspirable matter, we have reason to believe, are remarkably distinguished by two kinds of odour; the one peculiar to the whole species, the other peculiar to the individual. By the perspirable matter which adheres to the ground, and of which the odour is diffused by moisture, the dog not only distinguishes a man from any other animal, but is able to trace his master through a crowd.

The natural evacuations of plants, and of some few animals which feed by absorbents, are all by perspiration or exhaling vessels. The urine in quadrupeds is before emission collected in a vesicle, and thence carried off by the genital organ. In birds, and in a number of fishes, the ureters empty themselves into the rectum, and their contents are evacuated with the fæces.

Independently of being used to denote the function, the word secretion is sometimes employed for the matters secreted. In this sense there are various secretions. Besides the fæces, the urine, and the sweat, and the vapour from the lungs, which are excrementitious, there are secretions which answer useful purposes in the system. Of these the most important and general are the bile,

the saliva, the gastric juice, and the pancreatic; which assist in digestion; the lymph and the fat, which lubricate the parts; the mucus, which protects them from acrid substances; the nervous fluid, which forms a very conspicuous link between body and mind; the seminal fluid, employed in generation to propagate the species; and the lacteal, intended for some while to support the young after they emerge from the fetal state.

The saliva is a fluid that mixes with the food in the time of mastication. In man it is secreted from the parotid, the sublingual, and submaxillary glands; it is watery and somewhat viscid; it is found to retard and moderate fermentation; it has sometimes a tendency to form calculi like the urine. By these concretions it incrusts the teeth and sometimes obstructs the salivary ducts. It is the seat of the rabies canina.

Upon first examination the gastric liquor seems to possess a solvent power upon animal and vegetable substances, without any great preference of affinity. The reason is, it varies according to the nature of the aliment; it is sometimes acid, sometimes insipid. Brugnatelli has found (says Chaptal) in the gastric juice of carnivorous birds and some others, a disengaged acid, a resin, and an animal substance, united with a small quantity of common salt. The gastric juice of ruminating animals contains ammoniac, an extractive animal substance, and common salt. In our time the phosphoric acid has been found disengaged in the gastric juice of the graminivorous kinds.

The bile secreted by the liver is glutinous or imperfectly fluid like oil, of a very bitter taste, a green colour inclining to yellow, and froths by agitation like the solution of soap. Its constituent principles are water, a spiritus rector, a coagulable lymph, a resinous oil, and soda. The resinous part differs from vegetable resins, because these do not form a soap with fixed alkalis, because they are more acrid and inflammable, and because the animal resin melts at the temperature of 40 degrees, and acquires a fluidity similar to that of fat. From fat it differs in not being soluble in cold alcohol, in which respect it approaches to spermaceti, which alcohol cannot dissolve without heat.

Bile, like other soaps, removes spots of oil from those substances to which they are adherent; when its passages are obstructed, the motion of the intestines becomes languid. It is neither alkaline nor highly putrescent. In putrefaction it yields something of a musky odour; the fossil alkali precipitates from it a green sediment; and with distilled vinegar it produces a mixture neither acid nor sweet. Like saliva and urine, it has a tendency to form concretions which are called biliary calculi or gall-stones. They are sometimes found of an irregular texture, of a brown, black, yellowish, or greenish colour. They sometimes consist of transparent crystalline laminae, like mica or talc, and are sometimes radiated from the centre to the circumference. They are always inflammable, of a more solid consistence than the generality of animal oils, and resemble spermaceti both in their solidity and crystallization; they are soluble in ardent spirit when assisted by a moderate heat: the warm solution, when filtered, deposits by cooling a number of laminated white brilliant crystals, such as Poulletier de la Salle found in the bile, and which have been compared to the salt of benzoïn, the concrete acid of borax, and to spermaceti. Many of their characters indicate that they are a substance of the same nature with the last men-

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tioned. Fourcroy found that the substance of which these crystals are composed exists not only in the crystallized gall-stones or bile; he observed it to a very considerable degree in a human liver which had been exposed to the air for several years, and had lost its volatile parts by putrefaction. He detected it also in a saponaceous form in bodies which had been many years buried under ground; and Dr. George Pearson has artificially converted the muscular fibre into a substance of a similar kind, highly inflammable, and resembling spermaceti.

The pancreatic juice resembles the saliva, and was examined in the last century, with a good deal of care, by De Graaf and Swammerdam. It has often been observed forming stony concretions.

The lymph consists chiefly of water; but, like the serous part of the blood, contains a substance which is coagulable by heat, by acids, and by spirit of wine. It is found in the cellular membrane, in the ventricles of the brain, in the pericardium, on the surface of the pleura, in the abdomen, in the bursæ mucosæ, and in the joints under the name of synovia, where it has more than an ordinary degree of viscosity, and of the lubricating quality. Sometimes, when it stagnates in the sheaths of the tendons and bursæ mucosæ, it acquires a thickness, and forms indolent transparent tumours, which become at last gelatinous. It is secreted chiefly by arteries.

Animal fat is a substance of a nature similar to those oils which are called fat in the vegetable kingdom. Its colour is usually white, sometimes yellow, and its taste insipid. Its consistence is various in different animals. In cetaceous animals and fishes it is nearly fluid: in carnivorous animals more fluid than in the frugivorous: in birds, finer, sweeter, and more unctuous, and generally less solid than in quadrupeds. In the same animal it is more solid near the kidneys and under the skin than in the vicinity of the moveable viscera. As the animal grows old it becomes yellower and more solid; and in most animals is more copious in winter than in summer. In man and some other animals, it is collected in particular follicles of the cellular membrane, accumulated in great quantities in the groin, in the axilla, in the epiploon around the kidneys and around the blood-vessels: it is likewise secreted on the surface of the skin, which it protects from acrid substances, and where it sometimes concretes, often from a want of cleanliness, in the form of small worms. In cetaceous animals and fishes it is generally disposed in certain reservoirs, such as the cavity of the cranium and the vertebrae; in some it is chiefly confined to the liver; in serpents, insects, and worms, to the viscera of the lower belly, where it is disposed in small lumps, and only a small quantity found on the muscles and under the skin: in frogs it is collected in certain bags which diverge, as it were, from a common trunk, and seem like appendages to the ovaria and testes. In many places it seems to be secreted by organic pores, and under the surface of the skin by glands. It is accumulated from a diminution of perspiration, from the nature of the aliments, from morbid affection, and from idiosyncrasy. It is of the same nature as the fixed oil of plants; and Lorry has found a very striking analogy between it and the bile.

It is a bad conductor of heat, and preserves the warmth of those regions where it is situated. It is more adhesive and less apt to evaporate than water, and is therefore a better lubricating fluid. When

reabsorbed, it counteracts the saline impregnation if too copious; and its nutritive power is as three to one when compared to that of the muscular fibre. These properties may partly serve to explain its uses around the several branches of the blood-vessels in those parts which require warmth, and in those which are anywise exposed to motion. They will likewise account for its being more copious in winter than in summer; and for its being found in great quantities in the marmot, the dormouse, the bear, and those animals in general which are constrained to a long abstinence. It forms sometimes steatomatous tumours, and contains the sebaceous acid, which acts readily on lead, copper, and iron.

The vegetable fat is contained chiefly in the fruit; and is known by the names of fat oil, sweet oil, and oil by expression. It freezes in different degrees of heat, and varies according to the nature of the plant by which it is afforded.

The mucus is more viscid than the lymph, and is not coagulable by fire or alcohol. It is mild, not disposed to corruption, nor soluble in water. This secretion is performed by glands. These glands, in the pulmonary phthisis, secrete often a mucus that resembles pus, and occasions a suspicion of ulcers where there are none. Mucus is found in the nose, through the whole length of the alimentary canal from the mouth to the anus, in the aspera arteria, in the bronchia, in the kidneys, ureters, bladder, and most of all in the urethra. It forms hard stony concretions sometimes in the lungs.

The seminal fluid has been seldom the subject of chemical analysis. It is heavier than water, soluble in urine, deliquesces in air and with heat; it hardens with the fixed alkali, and is not coagulable by alcohol. It contains a number of animalculæ; and in the system in which it is secreted, it affects the passions, the manners, and the voice, the taste of the muscles, the secretion of fat, and the growth of the hair. In many fishes this fluid is contained in a sort of bags. In most animals it is secreted by glands, which are called testes, and is accumulated in the vasa deferentia, or where they exist in the seminal vesicles. Of these vesicles Swammerdam observed long ago, that in the scorpion they were probably adapted by nature to secrete a seminal matter different from that supplied by the testicles; they are largely (he says) supplied with glandules to answer that purpose, and consist of a considerably thick and spongy substance. Mr. Hunter since has endeavoured to show that they secrete a particular fluid in all animals.

So little are we acquainted with the nervous fluid, that some have doubted of its existence. The discovery, however, of Galvani, and the numerous experiments that have since been making on animal electricity, leave us not without all hope that something yet may be known of its properties, that will greatly illustrate several phenomena in the animal economy.

The lacteal secretion is generally confined to one sex, and is peculiar to the class of mammalia, though something similar may perhaps be secreted in the crops of pigeons.

It would be impossible here to enumerate or to tell the uses of all the different kinds of secretions in living bodies. We cannot enumerate all that we know without running into tedious detail. The essential oils, the camphor, the gums, the balsams, the resins, and many others, are various secretions of the vegetable kingdom. Each species of plant

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and animal has generally some peculiar secretion; and this secretion in the individual has often some distinguishing quality, discoverable by taste, by colour, or by smell. These different secretions have likewise each their particular uses. We know the intention of the oily juice with which the bird dresses its feathers, of the glutinous fluid of the fish, of the viscid mucilage of the snail; we see the purpose for which the viper sometimes employs its virulent humour, and for which the cuttle-fish ejects its ink: but yet we know only in part.

The difference among the various secretions of the same system seem principally owing to a difference of stimulants, and to some difference in the action, the form and the irritable power of the secretory organ. Passions of the mind very often affect the secretions; and it frequently happens that passion and medicine affect one secretory organ and not another. It is therefore probable that the organs of secretion, and the smallest fibre is an organ of this kind—we say, it is probable that the organs of secretion, like the eye, the ear, and all the different organs of sense, are each affected in some measure by peculiar stimulants; as the stomach by hunger, the fauces by thirst, and the genital organs by venereal orgasmus.

Fermentative mixture, and some original impregnation of the organs, have also been brought to explain the several phenomena of secretion. We conclude with observing, that however much the various fluids of living bodies may differ in appearance, chemical analysis has generally reduced them to a water, a gluten, a saline impregnation, and an oil.

All living bodies are furnished with one, two, or with more integuments, which are prepared by secretory organs, and which are a defence against those injuries to which their situation is commonly exposed. Of these integuments, some prevent the dissipation of the fluids, some again resist acrid and corrosive substances, some are indigestible in the stomach, and some are seemingly incorruptible in the earth. By these properties they preserve seeds and the ova of insects for a number of years, waiting the change of soil or of season. They protect both from the action of weak membranous stomachs, and make those animals who choose to swallow them contribute likewise to their propagation. The gelatinous substance ejected by birds, and called the tremella-nostoc or starfall, we have lately found, by numerous experiments, to be a substance of this kind. It is nothing else than the oviducts of frogs, which, as the embryo in form of an egg moves along their winding canal, are intended by nature to secrete that transparent and viscid glare which constitutes the albuminous part of the ovum, and feeds and protects the embryo in water.

Some integuments are chiefly useful by their strength and hardness. The shells of the beetle are an excellent defence for the membranous wings which the creature is seen to pack up in folds when it inclines to creep into the earth. The shell of the snail lodges the intestines when the animal comes forth to search for its food, and it furnishes a safe retreat for the body when any danger is threatened from without. Some animals, confined to their shells, can open and close them by a muscular power; and some shells, like the scales observed on fishes and insects, are disposed into plates, so as to be no hindrance to motion. Several insects which spend a part of their time in the water always compose a shell for themselves where

it is needful. The usual materials are sand, straw, or mud, which they cement by a viscid secretion. The shells of most insects are corneous. Swammerdam found that cretaceous shells are composed of layers of indurated membranes, and that they are sometimes covered with a cuticle.

Some integuments are covered with feathers, some with hair or a thick down. Besides many other obvious uses of these coverings, they serve in general to repel insects; and, being but bad conductors of heat, maintain a genial and necessary warmth.

When the integuments are covered with prickles, they repel attacks by the strength of their points, or by the venom which they infuse, as the stings of nettles and the downs of some insects and plants.

When they are moistened with a viscid secretion, they preserve the necessary softness of the parts, prevent evaporation, resist acrimony, enable plants to destroy their enemies, and assist the snail in performing its motions.

Both plants and animals, but particularly the former, are often protected by an odorous effluvia from their integuments. This effluvia is the finer part of their volatile oil, always inflammable, and so subtle, that the continual emission of it from wood or flowers does not sensibly diminish their weight. To this fragrance it is owing, that the deadly nightshade, the henbane, hounds tongue, and many others, are seen on almost every high road untouched by animals. The mancinelle-tree of the West Indies emits so very dangerous vapours, that the natives poison their arrows with its juices, and those have died who have ventured to sleep under its shade. The lobelia longiflora of America produces a suffocating oppression in the breast of those who respire in its vicinity. The return of a periodical disorder has been attributed to the exhalation of the rhus toxicodendron. Every one knows, says Chaptal, the effects of musk and oriental saffron on certain persons. Ingenhousz mentions a young lady whose death was occasioned by the smell of lilies; and Triller reports an instance of another who died in consequence of the smell of violets. The selection of grasses by different animals seems to be owing to the manner in which the volatile aroma affects their senses. But of all the vegetable exhalations known, those emitted by the bohun-upas, or poison-tree of Java, are the most remarkable. For many miles round no animal can breathe the air, no plant dares to peep from the soil, the fishes die in the poisoned stream, and the birds that venture athwart the atmosphere with despairing shrieks sink down lifeless. Such often is the use of the fragrant oils in the vegetable economy. The shrubs and trees that are covered with thorns are in general a grateful food to animals. They generously avow their manner of attack, and scorn the dark assassination by poisons.

The various colours of the integuments, as well as the aroma, is a species of defence. "Caterpillars which feed on leaves (says Darwin) are generally green, and earth-worms the colour of the earth which they inhabit. Butterflies which frequent flowers are coloured like them. Small birds which frequent hedges have greenish backs like the leaves, and light-coloured bellies like the sky, and are hence less visible to the hawk who passes under them or over them. Those birds which are much amongst flowers, as the goldfinch, are furnished with vivid colours. The lark, partridge, hare, are the colour of dry vegetables, or

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earth on which they rest; and frogs vary their colour with the mud of the streams which they frequent, and those which live on trees are green. Fishes which are generally suspended in the water, and swallows which are generally suspended in the air, have their backs the colour of the distant ground, and their bellies of the sky." The sphinx-convolvuli, or unicorn moth, resembles in colour the flower on which it rests; and among plants, the nectary and petals of the orphrys, and of some kinds of the delphinium, resemble both in form and colour the insects which plunder them, and thus sometimes escape from their enemies by having the appearance of being pre-occupied. From colour being thus employed as a defence, many animals vary their colours with the seasons and circumstances; and those which are of different colours in summer according to the places which they inhabit, do all in winter assume in common the colour of the snow.

But a change of colour is not the only change of the integuments. As the outermost are often insensible to stimulants, and for obvious reasons possess little of the vital principle; in all cases where they cannot be enlarged to admit an additional increase of growth, or where they are not furnished with necessary organs to repair those injuries which they may suffer from disease or accident, the body is endowed by nature with a power to throw them off, and to produce others in their stead. For this reason we see the tree casting annually its exterior bark, the lobster his shell, the bird his feathers, the quadruped his hair, and sometimes his horns, the serpent his skin, and man himself renewing the scales of the epidermis. These changes usually take place once a year, twice frequently with respect to serpents, and oftener in toads, who have been observed to devour the skin which they throw off. All the integuments of ova and seeds, being wholly the production of parental organs, neither are nor can be repaired.

GENUS VI.—*Nutrition.*

Nutrition is the function which assimilates the food in the several parts, and which finishes the process already begun in the stomach, in the lungs, and the vascular systems. In perfect animals some of the stages of this process are distinctly marked. The chyle, which has some resemblance to milk, is the work of the alimentary canal: it undergoes some new changes by the action of the lacteals, and of their glands when they exist. In the course of circulation it passes along the respiratory organs, and is mixed with oxygen or some other gas: by this mixture, the consequent heat, and the action of the vessels, it is turned into blood. The blood, when examined, spontaneously separates into three parts; an albuminous part or a serum, a coagulable lymph, and red globules. The two first are analogous to the white parts of an egg, by which the chick in ovo is nourished; the globules have some resemblance to the yolk, which serves afterwards as food to the chick in the more advanced period of life. The three parts contain each a variety of principles which are originally composed of gasses: these principles, conveyed through vessels of various forms, of various diameters, and with various degrees of motion and of heat, and all along varying as they pass, arrive at last on the confines of the parts which are wrapt up in a cellular tissue or some other membrane. The tissue or membrane

gives a new change; the parts nourished perform the office of secreting organs; and as the action of the vessels is varied according to the place to which they are tending and the parts which they enter, we see in some degree the manner in which bone, muscle, cartilage, and nerve, are all secreted from a common mass.

In worms and polypes, the function of nutrition is after digestion carried on almost entirely by the cellular tissue; and in plants by a tissue cellular and vesicular. In all living bodies the cellular tissue, besides giving a form to the parts, and besides preventing friction and cohesion, certainly performs some important office. Many have thought it the organ of nutrition; and it surely is one of the organs employed in assisting to assimilate the nutritious fluid. But it should be remembered, that all the parts of the living body are assimilating organs; that each part assimilates for itself; and that the stomach, the respiratory organs, the vessels, and nerves where they exist, are assistant to the whole, and to one another.

It is singular how any should have imagined that the nerves are peculiarly the organs of nutrition, or that growth should be owing to the addition of some organic and vivifying particles pre-existing in the food. These physiologists have not demonstrated the existence of nerves in all living bodies; and these organic and vivifying particles have as yet been discovered but in their fancy. Dr. Mouro has condescended to prove, that the limb of a frog can live and be nourished, and its wounds heal, without any nerves: and Mr. Hunter has given many instances of a living and nutritious power in the blood.

In plants and animals, the assimilating power has always certain limits prescribed to it: its influence is very generally confined to the sort of food congenial to the species; and its strength is varied according to circumstances, as the age, the habits, and the state of health. Those which are young assimilate faster than those which are old; and one species, which may partly be owing to the nature of their food, will assimilate much faster than another. Certain worms that feed on animal and vegetable substances will, in 24 hours after their escape from the egg, become not only double their former size, but will weigh, according to Redi, from 155 to 210 times more than before. Most oils are of very difficult assimilation; and those which are essential will often resist the long continued and the varied action of the living organs; will mingle with the parts, and, undecomposed, communicate their flavour.

An assimilating power is not peculiar to living bodies; it is observed in ferments and contagion, and is so obvious with respect to flame which is neither living nor organized, that whole nations who have seen it feeding on inflammable substances, have been disposed to think it was animated, to call it the principle of life itself, and to pay it a kind of religious homage as the proper emblem of that Being by whom the whole universe is upheld.

In living bodies nutrition is only a species of secretion.

We now pass on to the SECOND ORDER of M. Richerand's FIRST CLASS of functions, and which consist of those that establish his relations to surrounding beings.

GENUS I.—*Sensations.*

Irritability is that property of the living fibre

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by which it acts in consequence of stimulants. Being one of the great causes of motion in living bodies, no property has excited more wonder, been the cause of more error, or exhibits such a number of striking phenomena to the senses. These effects, however, have arisen rather from the nature of the stimulants than from any thing mysterious in irritability. Many of the stimulants by which this property in bodies is displayed are often invisible, unknown, or unthought of; and men being conscious that a number of their motions proceed from a stimulant that is under the direction of a mental power, they readily conclude from a sort of analogy, that every motion in plant and insect that seems to answer a useful purpose, and is caused by some invisible stimulant, is the consequence of mind directing from within. They further suppose that irritability is in all cases the consequence of nerves, which are those organs which nature has employed in the animal kingdom to convey stimuli between body and mind. These singular conclusions have led to others that are less admissible even than themselves. It has been imagined that creatures the most stupid possess within them a principle of mind that is incapable of further improvement, but which, notwithstanding, is in many respects superior to reason, and a surer guide in whatever relates to self-preservation or that of the species: it enables the animal to predict without foresight, and to act rationally without intelligence. This wondrous principle has been called instinct: and in order to account for some of the singular phenomena of vegetables, a share of it has graciously been allowed to plants; which having become favourites of late, have been also presented with the privilege of sensation, permitted to fall in love, and to marry, and on some occasions to exercise the faculty of volition.

At these concessions the metaphysician will naturally smile. He knows how many impose on themselves by the mere sound of their own words, as if by calling the snow black they were to discover a new property; which curious discovery would turn out at last to be only a gross ignorance of language, and the foolish misapplication of a syllable. He who has studied the philosophy of mind, and been accustomed to view objects through another medium than the magic colourings of passion and of fancy, readily perceives a something of absurdity in ascribing such wisdom to plants and insects. With respect to animals, these gentlemen do not recollect that voluntary actions are of two kinds, as they proceed from design or propensity; that in performing one of these kinds the mind itself has an object in view, and is properly the source whence they originate; but that in the other the mind is merely a secondary agent, is acting under the influence of stimulants, is often not aware of the consequences, or although aware, is often so infatuated as not to regard them, however fatal. It is generally well known to the naturalist, that not a few of these propensities arise from the form and structure of the body, from the manner in which the optic nerve is affected by colours, the olfactory by smells, the gustatory by tastes, and the auditory by sounds; from the different ways in which the fauces are affected by thirst, the stomach by hunger, and the genital parts by venereal orgasm.

Besides these and other propensities which operate as stimulants in the system itself, the naturalist has found that light, heat, and moisture, in various degrees from absolute darkness, coldness,

and dryness, act as stimulants upon living bodies: he has experienced that electricity is a general agent, that several plants emit flashes, and that some animals even give shocks resembling the electric. He has made it probable that it produces all the wonders of crystallization; and that the cause of chemical affinity, and of all the phenomena displayed by the magnet, if not simply a modification, is at least akin to it. In the male parts of plant and animal, he has seen both the fluid and the pollen that give the stimulus in generation, and are accompanied with so extraordinary changes in the system. He has found that much of the vegetable economy, and even the function of generation itself, as the development of the fecundating powder, and its application to the female organ, is partly carried on by wind, heat, and other such agents. He has reason to conjecture that many general agents in nature are yet unknown. By the help of chemistry, he has found out lately a considerable number which are called gasses, which are of the very highest importance in both the animal and vegetable economy, and which, like the aromas of plants, or the causes of contagion, produce their effects without being visible. It is only, too, of a late date that Galvani of Bologna has excited so much curiosity through Europe, by the discovery of a certain stimulus that resides in the nerves, that passes along electric conductors, and which by a certain application of metals occasions a vivid flash in the eye, convulses the body of a living frog, and rouses the detached limbs into action. The change of colour in the integuments according to different seasons and circumstances, though it answer a rational and useful purpose, proceeds from a cause that does not seem to be very well known. Even many agents which are not invisible, nor yet unknown, exert their influence in a secret manner, so as not to be obvious to the senses. It is generally known that many singular movements of plants are owing to heat, many to light, and several to moisture. The barley-corn is often observed to creep on the ground by means of its awn, which dilates or contracts according to the different degrees of moisture. The wild oat, employed as an hygrometer, moves through the barn, travels through the fields, nor ceases to be changing its situation till its beard fall off, or till it meet with a soil where it conveniently may strike root. Upon a similar principle of motion, the ingenious Edgeworth constructed an automaton which moved through a room which it inhabited. It is easily conceived how these singular effects, arising from causes that are unknown, invisible or unthought of, should give birth to the notions of witchcraft and of instinct, and impress the fancy with an idea of something resembling sensation and volition in the vegetable kingdom. These agents, whether invisible, unknown, or unthought of, directed by regular and uniform laws under the great Author of nature, produce effects that indicate prescience, wisdom, and design, and, causing a transient or permanent propensity in the mental part, frequently controul by resistless sway the finite minds that reside in matter. These minds, in a living body, have generally been found accompanied with some system of nerves; and these nerves happening with equal facility and promptness to convey stimuli from the mind to the body and the body to the mind, the great difficulty has been to determine with respect to others when the action proceeds solely from design, solely from propensity, or

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from design and propensity together. The uniform conduct of the brute creation would seem to imply that their mind has little of inventive power; that it generally acts from the impulse of propensity; and that its manners are varied, not in consequence of a change of sentiments, but from the induction of new habits, and the application of new stimulants.

It has been observed, that in all animals the vigour of mind has some relation to the quantity of brain in relation to the nerves that issue from it, which is the judicious distinction of Soemering, and to the perfection of its organization; and that the acuteness of the different senses is generally proportioned to the quantity of nerve bestowed on their organs. Man has a greater proportion of brain than any other animal in proportion to the aggregate amount of its nerves; but many an animal has a much greater proportion of nerve bestowed on different organs of sense. Many animals have therefore acuter senses than man; but man has a greater vigour of mind than any other animal on this globe.

The brain of quadrupeds is somewhat similar to that of man, but proportionally smaller, in regard to its aggregate bulk of nerves, and not perhaps so well organized. Willis has observed, that among animals the structure of the cerebrum is more variable than that of the cerebellum; that the former generally furnishes nerves to the voluntary muscles, and the latter with the medulla oblongata to the involuntary. He has likewise remarked, that the round prominences, commonly called the nates and testes, are large in the quadrupeds which are active and vigorous, and in some measure able to procure their own subsistence at birth; that the tuber annulare is large in the quadrupeds that are distinguished for their sagacity; that wherever the tuber annulare is small, the prominence are large, and wherever it is large the prominences are small. From these observations he has concluded that the tuber annulare is the seat of genius, and the round prominences the seat of what has been called instinct.

The brain of birds is seemingly the reverse of the human brain; the cortical substance is the interior, and the ventricles are situated in the white part on the outside. In the brain of the bird there are no circonvolutions like the intestines, no fornix, corpus callosum, nor corpora striata.

The brain of fishes is in many respects similar in its structure to the brain of birds. It is very small in proportion to their body, and is generally surrounded with an oily matter. In one genus of fishes, the gadus, Dr. Monro found spheroidal bodies between the dura and pia mater, and covering the greater part of the nerves like a coat of mail. The two senses, seeing and hearing, in many fishes are often acute. By laying one ear on the water, and striking the surface at some distance, this element is found to be a better conductor of sound than even the air.

The reptile tribes have very little brain, and like the fishes have no ganglions upon their nerves.

Most insects have no brain at all, but a nervous cord that is full of ganglions, that runs from one extremity to the other, and is denominated the spinal marrow. This knotty cord, however, is not marrow; the insect has nothing resembling a spine; and the situation of the cord in the animal is often not along the back but the breast.

In the silk-worm, and most other insects, this cord is in contact with the alimentary canal; and the first ganglion, which is sometimes called the brain, though not in the head, divides, in order to give a passage to the stomach, and again unites in a second ganglion. Swammerdam found in a species of snail a brain with two lobes, in contact with the stomach, moveable by muscles, and without a fixed place in the body.

The polytypes exhibit no appearance of brain or of nerve, as in other animals. Their skin, however, is observed to be full of a number of small granular bodies, which are connected by a glaucous matter that resembles a thread. Like rows of bead-strings, they extend from one extremity to the other, and along the arms. Trembley learned from a number of experiments that they received their colour from the food, and therefore supposed them to be vesicles or glands. If not like the tuberos nerves of the insects, they at least are not very different in appearance from the nerves of the gadus that are covered with a number of spheroidal bodies like a coat of mail.

Some things would insinuate that a nervous system does not seem to be necessarily connected with mind. The stimuli of nerves may be brought into action by other causes besides mind. Even many nerves are not subjected to the influence of mind; and the mind often by its own inattention may lose the power which it originally possessed over nerves. Many persons can move the muscles of the ear, and others may have lost that power through neglect. After Fontana had observed that the heart was a voluntary muscle in a wheel polype, he learned to retard and accelerate the motions of his own at pleasure. If some nerves, from a sort of prescription, thus cease to be obedient to the power of mind, others by frequent service and habit become so obedient as to convey their stimuli to the muscles almost without the consciousness of mind. The motions excited by the stimuli of nerves are in many cases exceedingly rapid. These may be seen in the wings of most insects, but are most noticed in dancers, tumblers, and apes, and all those animals that are exhibited for feats of agility.

The motions which we see excited in the body by the stimuli of nerves have often been so vigorous and prompt, as to have torn the muscle from the bone, and to have broken the bone itself. They often affect the organs of secretion, have often unhinged the fabric of the system, occasioned death, and accounted for the miracles that have been ascribed to the power of fancy. The prompt motions of what have been named sensitive plants seem owing to a different species of stimulants acting on extremely irritable fibres.

In the animal kingdom, all muscles in the time of action are observed to discharge a quantity of their blood; and those muscles which are naturally white are the most irritable. In all living bodies, the irritable power will cease to obey the action of a stimulant, if either long or violently applied. After exercise, therefore, the irritable fibre requires rest, after heat cold, after waking sleep, before it again becomes submissive to the action of the stimulant that overwhelmed it. This is the reason that in plants and animals there are certain exertions and functions of the system that can only be continued at intervals and seasons. The natural stimuli of involuntary muscles continue to act, and the muscles continue to obey through life. See the article SLEEP.

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The organs of sense were formed to mark the difference of stimulants; yet living bodies are affected by light without having eyes, by sounds without having ears, by odorous effluvia without having smell, and by sapid bodies without having taste. It is easily conceived how these objects, by their inherent properties or motion, may produce a confused sort of excitement in every highly irritable fibre. But the organs of sense are peculiarly fitted to receive accurate and distinct impressions from each of these objects; and these different impressions seem not to arise from any difference in the kind of nerves by which they are received. All the difference that has been observed arises from the structure of the organ itself, and from the manner in which the nerve is distributed through it. Other parts of the animal body, as the stomach, the fauces, and the genital organs, are thus affected by particular stimulants; and many animals, and even vegetables, may be affected in various manners, and by various stimulants, of which neither our feelings nor our senses can give intimation of anything analogous.

With respect to the several organs of sense, some animals have many eyes without any motion, and some animals have few eyes with varieties of motion. The entrance to the ear in some animals is from the mouth, as happens in the frog; and the bones of the ear are without the cranium, as in some fishes. The sense of smelling is found in the nose: this sense is astonishing in dogs; and even sheep, in distinguishing their lambs, trust to it more than to seeing or hearing. The sense of taste is far from being general; and the sense of touch resides generally, though more acutely in some organs than others.

GENUS II.—*Motions.*

Irritability is one of the great sources of motion in all living bodies; and this power is brought into action immediately by nerves or some other stimulants. Locomotion here is principally considered; for although the kinds of internal motion employed in secretion and the other functions be as remarkable, in the eye of the philosopher, they have not so generally attracted attention. Most animals are capable by nature of changing the place which their body occupies; for this reason, the irritable fibres, being formed into bundles which are called muscles, are in most animals attached to bones, cartilages, or hard integuments, which they move as levers: these levers, with their muscles attached, are in most cases formed into wings, fins, and legs of various kinds, and are employed in performing the motions of flying, swimming, walking, leaping, and creeping. So very necessary, in the opinion of some of the ancients, was one or other of these instruments to progressive motion, that the movement of the serpent was often ascribed to a preternatural cause, was supposed to resemble the *incessus deorum*, and procured to the animal one of the highest and most honourable ranks among the emblematic kinds of divinities. Notwithstanding, however, the surprise that has been occasioned by its singular movement, the motion of snails, though not so rapid, is in many respects as extraordinary: they adhere by a certain viscid secretion; on dry ground this secretion forms a pavement over which they glide; and they proceed by the action of muscles, without bone, cartilage or shell to which these muscles can be attached.

No animal walks without legs or flies without

wings; but there are many that swim without fins, and that leap and creep without any legs. The rapidity of movement is not proportioned to the number of instruments that are employed: if the spout-fish be observed to move slowly with one leg, the sea-urchin moves still slower with many thousands; the oyster moves by squirting out water; the scallop by the jerk of its shell, and when in the water it rises to the surface and sails before the wind.

Many animals are formed by nature to fly, walk, leap, and swim: the fate of those is rather uncommon whose muscles or feet are by nature attached to their integuments; the lobster is obliged to throw off its shell, and the caterpillar all its feet with the skin, and in that situation to remain stationary till it receive new instruments of motion.

Whoever has read the celebrated work *De Motu Animalium*, needs not to be told that, besides the organs which are here mentioned, the form, the structure, and even the specific gravity of the body, as depending on the nature of the bones and muscles, or as varied by air, vesicles, and bubbles, with a great variety of other circumstances, are necessary to explain the different phenomena of locomotion.

As to vegetable motions, they evidently depend on external agents. The motion of the wild oat has been mentioned; the wings of seeds only fit them to be carried by the wind, their specific gravity to float in the water, and their legs or tentacles to adhere to bodies that are in motion: the singular motions which have been ascribed to sleeping, to waking, to sensation, and volition, in the vegetable kingdom, seem only the consequence of light, heat, moisture, and such stimulants, acting invisibly or with secret influence: the opening and closing of the meteoric flowers are always correspondent to the states of the atmosphere; and the opening and closing of the equinoctial and tropic flowers, to the light, the length, or shortness of the day.

The principal intentions of locomotion are, to get food, to shun danger, to promote intercourse, and disperse the species.

GENUS III.—*Voice and Speech.*

The voice is a sound resulting from the vibrations which the air suffers during its passage through the glottis, when expelled from the lungs. Speech or articulated voice is produced by this sound modified by the motions of the tongue, lips, and other parts of the mouth. It is obvious, therefore, that no animals can have a voice, unless they possess lungs.

The larynx is the instrument of the voice, of which the rima glottidis is the immediate organ. Hence, if the trachea be opened below, so as to prevent the air from passing through, the voice is destroyed; while, if the opening be made above, the speech only is destroyed.

It is universally agreed among physiologists, that the air, expelled from the lungs in expiration, striking against the sides of the rima glottidis (chordæ vocales) constitutes the voice. But it is necessary that the opening should be placed in some condition produced by an exertion of the will; for although air is constantly passing to and fro, the voice is not formed unless by an express effort for that purpose; neither is it formed during sleep; nor after the muscles of the arytenoid cartilages have been paralysed by dividing their nerves.

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The manner in which the voice is changed from acute to grave, and *vice versa*, has been much disputed: whether it arise from dilatation and contraction of the aperture, or from tension and relaxation of the chordæ vocales. On the former supposition the human larynx may be compared to a wind instrument, in which the enlargement of the aperture renders the sound grave, and its diminution acute. By the latter explanation it resembles a stringed instrument. After considering the arguments on both sides, we should be inclined to admit the operation of both causes. The change of the voice from acute to grave at the time of puberty, when the larynx undergoes a remarkable development, as well as its acuteness in females, whose glottis is less by one third than that of man, show that the size of the aperture has a great influence. Observing on the other hand that the vocal chords admit of considerable tension and relaxation, we must allow that these variations will render them susceptible of executing, in a given time, vibrations more or less extensive and rapid. And although they are neither dry, stretched, nor isolated, which are necessary conditions to the production of sound in those stringed instruments to which the larynx has been compared, yet they are analogous to vibrating bodies placed at the top of wind instruments, as the reed in hautboys, the mouth-piece in flutes, &c. and equally contribute to the formation and varied inflexions of vocal sound. That all the changes and conditions of the vocal organs, of whatever description, necessary to the production and modification of sounds, are produced by the muscles of the part, is rendered obvious by the elegant experiment, in which the ligature or section of one or both recurrent nerves, or *paria vaga*, either signally impairs, or entirely destroys, the vocal powers of the animal.

The modifications of the voice are also affected by the length of the trachea; hence the larynx is manifestly drawn up in the neck, in the utterance of acute sounds, and as plainly descends when a grave sound is produced. In singing, where these effects take place in a greater degree, the head is thrown back upon the neck in the former case, and brought forwards on the chest in the latter.

The voice is stronger in proportion to the capacity of the thorax; hence it is weaker after meals, when the stomach, distended by food, prevents the descent of the diaphragm, and in consumptive persons, where the capacity of the lungs is diminished by disease. It acquires more force and intensity, and becomes more sonorous, by its reflections in the mouth and nasal canals. Hence it is disagreeably altered when its passage in this direction is stopped by disease, as by polypus, and it is then commonly, but quite erroneously, said that persons speak through the nose.

Whistling, which is common to man with singing-birds, is produced in the latter by their double larynx; but in the former it is effected by a contraction and corrugation of the lips, in imitation of the effect produced by birds.

In singing, the voice runs through the different degrees of the harmonic scale with more or less rapidity, changing from acute to grave, and *vice versa*, with an expression of the intermediate notes. It requires much more exertion than speech. The glottis enlarges and contracts, the larynx is elevated or depressed, the neck elongated or shortened, inspirations are accelerated, prolonged, or retarded; expirations are long, or short, and abrupt. The power of singing is peculiar to man, and forms the great prerogative of his vocal organs. Whistling is

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common also to birds; which are often taught to pronounce words without any great difficulty. On the other hand parrots are said, in two or three instances, to have been taught, by vast labour, to produce a kind of imitation of singing; but no barbarous tribe has been, hitherto met with, which has not been accustomed to employ singing as the natural expression of their feelings and passions.

Speech is a peculiar modification of the voice, formed during the expulsion of the air from the chest, chiefly by means of the tongue, which is applied to the neighbouring parts, as the palate and teeth, assisted by the various motions of the lips. A voice is common to brutes with man; it exists already in the newly-born child, and has not been entirely wanting in those miserable children who have grown up in a solitary and savage state, or who have been born dumb. Speech results from the enjoyment and cultivation of reason, and is, therefore, like that endowment, a peculiar and distinguishing gift bestowed on man alone. Instinct is sufficient for the purposes of brutes; but man, who does not possess this, or several other assistances, in supporting and defending himself by his own powers, has received the endowments of reason and speech. These have brought him into the social state, which seems to be his natural destination, in which they enable him to utter his ideas and impart his desires to others.

Articulated sounds are represented by letters that express all their power; and it will be readily admitted that man made a great step towards perfection, when he invented these signs, adapted to preserve and transmit his thoughts. Sounds are expressed by the letters called vowels, which are letters produced by the mere passage of the voice through the mouth; requiring only a greater or less aperture of the mouth. Hence these are the first that the child utters. The consonants, which form the most numerous class of the alphabet, serve to connect the vowels, and are formed by a much more artificial process. These are classed into labial, nasal, oral, and lingual, according to the parts more particularly employed in their pronunciation.

Stammering is a corruption of pronunciation arising from various causes. A tongue too large and thick, diminished power over its actions, as in drunkenness, and unusual length of the frenum belong to this class. Yet sometimes the deficiency does not seem organic; at least a person who stammers will pronounce perfectly if he speak slowly; and it may even be entirely overcome by practice and instruction.

Similar causes give rise to lisping. Want of the front teeth will have this effect.

Dumbness may be accidental, or may subsist from birth. In the former case it arises from organic injury, which affects the mechanism of the parts. In dumbness from birth, deafness seems to be always the cause; so that the absence of speech should here rather be called silence. This, at least, is constantly the case according to the observation of Sicard, on the numerous pupils committed to his care. Here there is an absolute ignorance of sounds, and of their representative value in letters of the alphabet. The vocal organs exhibit no marks of deficiency; they are fit, in short, to fulfil the uses for which nature has destined them, but they remain in a state of inaction because the deaf infant is not conscious that he has the means of communicating his thoughts.

Perhaps the mechanism of *ventriloquism* is not yet understood. The following quotation from

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Richerand's physiology will be sufficient to give the reader an idea of the subject.

"At first I had conjectured that a great portion of the air expelled by expiration did not pass out by the mouth and nostrils, but was swallowed and carried into the stomach, reflected in some part of the digestive canal, and gave rise to a real echo; but after having attentively observed this curious phenomenon, in Mr. Fitz-James, who represents it in its greatest perfection, I was enabled to convince myself that the name ventriloquism is by no means applicable, since the whole of its mechanism consists in a slow, gradual expiration, drawn in such a way that the artist either makes use of the influence exerted by volition over the muscles of the parietes of the thorax, or that he keeps the epiglottis down by the base of the tongue, the apex of which is not carried beyond the dental arches.

"He always makes a strong inspiration just before this long expiration, and thus conveys a considerable mass of air into the lungs, the exit of which he afterwards manages with such address. Therefore repletion of the stomach greatly incommodes the talent of Mr. Fitz-James, by preventing the diaphragm from descending sufficiently to admit of a dilatation of the thorax, in proportion to the quantity of air that the lungs should receive. By accelerating or retarding the exit of the air, he can imitate different voices, and induce his auditors to a belief that the interlocutors of a dialogue, which is kept up by himself alone, are placed at different distances; and this illusion is the more complete in proportion to the perfection of his peculiar talent. No man possesses, to such a degree as Mr. Fitz-James, the art of deceiving persons who are least liable to delusion: he can carry his execution to five or six different tones, pass rapidly from one to another, as he does when representing an animated dispute in the midst of a popular assembly."

We now advance to the **SECOND CLASS** of Mr. Richerand's division, which consists of functions contributory to the preservation of the species, the **FIRST ORDER** referring to those that require the cooperation of both sexes: upon which we shall only offer a few general observations to what the reader will already find under the articles **ANATOMY, COMPARATIVE ANATOMY, FETUS, and GENERATION.**

The bodies of the male and female present very obvious differences in appearance and character, which have been ascribed to the influence of the generative organs upon the constitution. The removal of the testes in the male prevents those changes in the beard and voice, at the time of puberty, which would otherwise occur: and eunuchs even approach in other respects to the female character, as in the breadth and projection of the hips. Again, in some remarkable cases, where the organs of the female have been wanting, or mal-formed, similar effects have taken place in the constitution; so that there is some reason for saying with Van Helmont, *propter solum uterum mulier est, id quod est.*

Hermaphroditism, or the union of both sexes in the same individual, is impossible in man and the warm-blooded animals. All the supposed hermaphrodites hitherto examined were mal-formed beings, whose male organs were imperfect, or the female apparatus too prominent, so as to render the sex doubtful. No one has shown himself capable of impregnating his own person, so as to produce a being like himself; indeed, in most instances persons thus misconstrued have been in-

capable of assisting in reproduction, the imperfection of the organs employed for this purpose having condemned them to sterility.

Man presents a peculiarity, in not being subject to the influence of the seasons in the exercise of his generative functions; while other animals only cohabit at fixed periods and certain times of the year, and afterwards seem to forget the pleasures of love to satisfy other wants.

Conception. Physiologists have not hitherto succeeded in explaining the mechanism of that elongated and distended state of the penis, occurring under the irritation of the sexual passion, which adapts the organ to the performance of its natural functions. The obvious circumstances are, that the cells of the corpus spongiosum urethræ, and corpora cavernosa penis, are distended to the utmost with blood, poured into them from the arteries much faster than it can be, or at least is returned by the veins. The irritation, which affects the penis, extends to the internal parts. The secretion of the testes becomes more active, and these bodies are drawn up towards the abdomen; the vesiculæ seminales, and the ducts of the prostate, also pour out their contents into the urethra. The semen is a mixed fluid, derived from the three sources just mentioned; but the smallest part probably comes from the testes. The most remarkable circumstance in this fluid is, that it contains numerous microscopic animalcula, with a round head and slender tail, moving about with rapidity.

The prolific liquor is expelled from the penis by a spasmodic action of the accelerator urinæ muscle: the whole body seems to participate in the same convulsive state, and the instant of ejaculation is marked by an orgasm through every part. It seems that nature has forgotten, for the moment, every other function, and is totally occupied in collecting her powers, and directing them towards the same point. Hence an universal languor follows this general convulsion, and hence the old observation, *omne animal post coitum triste.*

The seminal liquor, thus propelled into the generative organs of the female, is supposed to pass through the uterus and fallopian tubes, and to come into actual contact with the ovaria. The closeness of the mouth, and indeed of the whole cavity of the uterus, together with the very small calibre of the fallopian tube, especially at its origin in the uterus, (where it will only admit a bristle) are difficulties in the way of this explanation, which have led to the opinion, that the semen itself does not penetrate into the uterus, but that an exhalation, or *aura seminalis*, comes into contact with the germs, and is sufficient for their fecundation. This is opposed by the experiments of Spallanzani and others, in which the ova of frogs were readily impregnated by contact of the seminal fluid, but were not at all affected by the vapour or aura.

The attachment of the fimbriæ of the tube to the ovarium, which experiment has shown to occur during coition, establishes an uninterrupted canal from the uterus to the ovarium, and prevents the semen from becoming diffused in the abdomen.

The germ of the future being upon the system more generally admitted pre-exists in the ovarium, where it is formed by a peculiar action of the part, in short, by a true secretion. This germ, in its original state, is a small vesicle of fluid, first noticed by De Graaf, whence the term of ovula Graafiana, applied to their appearance in the virgin ovary. Here we do not mean to countenance

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those doctrines of evolution which suppose, that generation only develops germs that have existed from the beginning of the world. It is enough to suppose that the ova produced by the elaboration of blood, carried to the ovaria by the spermatic vessels, contain the rudiments of the new beings. But the germs in that state are inert, and require that the seminal spirit should be employed to rouse them from their inactivity. In birds and reptiles the formation of the germ by the female is incontestable; it is not quite so obvious in the class of mammals; but we infer it here from analogy, and also from the experiment of Mr. Hunter, in which the removal of one ovary from a sow diminished in a remarkable degree the number of young produced.

The SECOND ORDER under the SECOND CLASS, relates to those functions which belong exclusively to the female, such as gestation, parturition, and suckling; upon all which we have already observed in the articles referred to under the last order.

Fetal existence is purely vegetative. The fetus receives the fluids brought by the vessels of the mother to the placenta for its growth and nourishment. It may be considered as a new organ, the produce of conception, participating in the general life, but possessing a vitality peculiar to itself, and, to a certain degree, independent of that of the mother. To say that it is asleep is erroneous; for not only are the organs of sense and voluntary motion in a state of perfect repose, but also several of the assimilating functions are totally unemployed, as digestion, respiration, and the generality of the secretions. The fetus, however, performs spontaneous motions, which accoucheurs enumerate among the signs of pregnancy. It is nourished, like every other organ, by appropriating to itself whatever is found in the blood, brought by the vessels of the uterus proper for its purpose; and the interception of this fluid by the ligature, or compression of the umbilical chord, occasions death.

Suckling. The close sympathy between the uterus and breasts is so obvious, as to attract the notice of every observer. Both these organs are developed at the same period of life, and cease together to perform their functions, when the female becomes incapable of contributing towards the continuation of the species. The breasts increase in size during pregnancy, but are never more swelled than after parturition. The infant applies its mouth to the nipple, and sucks; *i. e.* forms a vacuum by inspiring, in consequence of which the atmospheric pressure forces the milk through the lactiferous tubes into its mouth. The nipple experiences a vascular turgescence, or kind of erection; which also affects the excretory tubes of the mammary gland, so as to cause them sometimes to expel the fluid to some distance by jets. The structure of the breast is explained under the article MAMMARY GLAND, and the composition of their secretion under MILK.

The remaining divisions of M. Richerand's classification form what may be regarded as a kind of appendix to it. They comprise the growth of the body, manhood, with its various temperaments, idiosyncrasies and transformations, decay and death.

GENUS I.—Growth of the Body.

The first perceptible traces of the fetus occur about three months after conception. It is then animated by a very slight kind of vegetable life, and possesses true blood, and motion of the heart about the fourth week. The latter, as observed in the chicken, has been named, from the time of

Aristotle, *punctum saliens*. The formation of the bones commences about the seventh or eighth week. The earthy particles are first deposited in nuclei in the clavicles, ribs, vertebrae, larger cylindrical bones of the extremities, lower jaw, and face: a very delicate network is also seen in some of the bones of the cranium.

As a general observation, it may be affirmed, that the growth of the embryo, as well as of the child, both before and after birth, is more rapid in proportion as it is younger.

About the middle of pregnancy, the operation of some vital functions is discerned: the secretion of fat and bile commences. At a more advanced period of utero-gestation, the scalp is covered with a short and delicate hair; the nails are formed; the membrana pupillaris destroyed; the external ear becomes firmer and more elastic; and the testes descend.

Besides the important changes in the whole economy which follow parturition, there are certain alterations in the external habit of the body. The down which covers the face at birth disappears; the rugæ of the skin are obliterated; the anus becomes hidden between the buttocks, which are now gradually formed.

The infant gradually brings into action the faculties of the mind. It perceives and attends to external objects, remembers, desires, &c. It smiles in the second month, and seems to dream at no great length of time after birth. The organs of sense become more complete in their formation. The bones of the skull become stronger, and the fontanels are diminished. Dentition commences about the eighth month. The infant may then be weaned, as his teeth enable him to commence the use of more solid food. About the end of the first year he learns to stand on his feet, and to assume the erect posture, that most distinguishing attribute of the human body.

When it has now been removed from the breast, and learned the use of the lower limbs, its powers and independence increase daily, and receive a vast accession from the development of another peculiar privilege of the human subject, the enjoyment of speech; by which the tongue, under the direction of the mind, pronounces those ideas which are now become familiar.

At the seventh year the twenty milk teeth begin to fall out, and are succeeded in a gradual progress during the following years by the thirty-two permanent teeth. At this time the memory excels all the other faculties of the mind; whereas about the fifteenth year the powers of imagination begin to prevail. This is the time of puberty, in which the human subject is gradually prepared, by various important changes, for the exercise of the sexual functions. The breasts enlarge in the female, the chin becomes covered with hair in the male, and other similar signs of puberty are noticed in both sexes. The menstrual discharge commences in the softer sex; and this important era in the economy of the female is marked by an increased expression in the eyes, and redness of the lips, and more manifest sensible qualities in the matter of perspiration. The seminal secretion becomes active in the male, attended with an increase of the beard, and a deepening of the voice consequent on a remarkable development of the larynx. The internal and spontaneous calls of nature now rouse the sexual instinct, for the exertion of which both sexes are prepared.

No definite and precise period can be assigned for the changes which constitute puberty: it varies ac-

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cording to climate and temperament. It is more early in the female than in the male; but in this climate girls may be said to attain it at the age of fourteen or fifteen, and men at seventeen or eighteen. Soon after these periods the growth of the body is completed; the stature of which varies much in different races, not to mention its varieties in individuals and families. The epiphyses, which have hitherto been distinct from the body of the bone, are now completely consolidated with it.

GENUS II.—*Manhood.*

Virility or adult age begins from the twenty-first to the twenty-fifth year. If the increase of the body in height have ceased at this time, it grows in other dimensions. The organs become firm and consistent; their functions are performed with vigour; the intellectual and moral faculties are perfected; and the dominion of the judgment succeeds that of the imagination. This period, which is called that of mature age, extends to the fiftieth or fifty-fifth year in men, but not much beyond the forty-fifth in women, in whom it begins earlier. During this long interval men enjoy all the plenitude of their existence.

Temperaments. As the characters of the human species are now fixed with stability, we may sketch the differences which mark individuals. Health, in the explanation of which all physiology is concerned, consists in such a harmony and equilibrium of the material fabric of the body, and of its animating powers, as is necessary for the performance of the various functions. It requires, therefore, fluids rightly prepared; solids duly formed from these; the latter thoroughly animated by their vital powers; and, lastly, a sound mind in this healthy body. These four principles are constantly acting and re-acting in the human body. The fluids act as stimuli on the solids; which possess vital powers, enabling them to receive those stimuli, and to react. The connection of the mind and body is not discerned merely in the influence of the will, in what physiologists call voluntary actions; since the affections of the body clearly act on the mind in many other ways than through the medium of sensual perceptions. The infinitely varied modifications, which the four principles admit of, show immediately with what latitude our notions concerning health should be formed. Hence arises the distinction of temperaments; that is, the different manner in which the living solid is affected by stimuli, particularly of the mental class, the different aptitude for such impressions, and the greater or less facility with which these stimuli may themselves be excited. There is such great variety of degrees and combinations of temperaments, that a wide field is open for those who wish to employ themselves in dividing and arranging them. The common division is sufficient for our purpose; it comprehends the sanguineous, which is very easily but slightly affected by stimuli; the choleric, which is easily and strongly excited; the melancholic, which is slowly but deeply moved; and the phlegmatic, which is the slowest of all in admitting the impressions of exciting causes. Together with these distinctions, there are numerous differences of bodily formation, of diversity in the proportion and connection of parts, as well as in the energy relative to certain organs, accompanying each temperament, which cannot be particularized here without entering too much into detail.

Each individual has a particular manner of being, which distinguishes his temperament from that of every other, to which, notwithstanding, it

may bear a very strong resemblance. These individual temperaments, the knowledge of which is of no small importance in the practice of physic, are called idiosyncrasies.

There are many both predisposing and occasional causes, which have an operation in producing this diversity of temperaments: as hereditary disposition, climate, diet, religion, culture, luxury, &c. all which may be regarded as so many modifications of habit; and the effect of habit is well known to be so powerful as in many instances to produce a sort of new or secondary nature. Thus at the Cape of Good Hope the ostrich inclines to sit on her eggs day and night like any other bird; but in Senegal, where the heat is greater, she is somehow disposed to leave them to the sun during the day. In those countries where provisions can be found during the greatest part of the year, the bee gradually loses the propensity of laying up stores for the season of winter; and in "those countries infested with monkeys, many birds (says an amusing and instructive writer) which in other climates build in bushes and the clefts of trees, suspend their nests upon slender twigs, and by this ingenious device elude the rapacity of their enemies." Man, from imitation, is exposed to a great number of habits peculiar to himself; and physical causes have ingeniously been assigned for the variety of his features and complexion.

Few experiments have yet been instituted with a view to show how far this accommodating principle in nature may be extended in the different species of plants and animals. It is known, however, that the lamb and the dove can be made carnivorous; and that the hawk, laying aside his ferocity, can be brought by art to live upon grain.

Of all the effects of this singular principle, the most wonderful are those which are seen to take place with respect to generation. The fact is far from being new to the naturalist, that certain animals, oviparous at one season, are viviparous at another. This indicates much of accommodating power, though far inferior to what has been since witnessed and displayed: for who from all this could suspect, that any animal which usually propagates by an intercourse of sexes, could in any circumstance accommodate so far as to multiply its species another way? Bonnet of Geneva, however, has discovered, that the puceron or vine-freter, which generally propagates by an intercourse of sexes, is not only oviparous at one period and viviparous at another, but, in all cases where the union of the sexes is not to be obtained, can easily accomplish all the purposes of generation without it. Similar experiments have likewise proved, that many plants can bring to maturity a productive seed, though the male parts of the flower be destroyed before they can in the usual way have any impregnating effect on the female. In this case, the conclusions drawn have been somewhat new. From these experiments it has been inferred, that the sexual system is ill-founded, and that most of the learned naturalists of Europe are on this subject labouring at present under a mistake. This reasoning, however, is not satisfactory: for why, it might be asked, in the vegetable kingdom more than in the animal, should the mode of generation be necessarily uniform? Though some plants may, like some animals, propagate without sexual distinctions, the conclusion is not logical that these distinctions are useless in all; and though some few may, in particular instances, propagate without that impregnation to which they were ac-

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customed, will any one demonstrate, that accommodating nature does not here as in the puceron adopt a new method to accomplish her designs?

In all living bodies, it frequently happens that several characteristic distinctions, as the colour, the features, and a number of diseases that are originally the effects of circumstance, do at last become so fixed in the system, that they are afterwards transmitted to posterity through some generations. With regard to animals these facts are well known; and as to vegetables, it has been observed by a pupil of Linnæus, that the apple-trees which are sent from Britain to New England blossom at first too early for the climate, and bear no fruit; and that it is only after some years that they conform to their situation: and this circumstance, by the way, explains why roots and seeds germinate sooner when brought from southern than when they are brought from northern latitudes. The very permanency of these effects has often been the cause of much confusion and error in philosophy: for the naturalist, mistaking the lasting though temporary qualities of habit for the real and essential qualities of species, has not unfrequently drawn conclusions from his experiments that have been contradicted by similar experiments in other circumstances. This is one of the obvious reasons why experiments exhibit so many inconsistencies and contradictions, and why we are amused with such a multitude of visionary theories about the properties of living bodies.

From not attending to the numerous circumstances that induce habits, and to that general accommodating principle in living bodies, many medical prescriptions are found to be not only useless but mischievous; and many parents, by studying the health and comfort of their children, bring on habits that prove the sources of perpetual sickness, or the certain presages of an early death.

The accommodating principle is one of the consequences of irritability. Its various effects arise from the actions of different stimulants on the irritable fibre; and the after-duration of these effects, from the modifications of the irritable fibre, become habitual from the frequently repeated action of the stimulants.

The design of this accommodating principle is to fit both the plant and the animal for a more extensive and a more varied range of existence.

More remarkably striking however than any of those changes to which the plant and animal are exposed, from the variations of habit or the change of integuments, are those alterations which they undergo from metamorphosis or transformation. It has indeed been asserted, that these alterations consist in throwing off certain temporary coverings or envelopes: but there is here a want of precision in the ideas, and consequently a want of accuracy in the expression. The same persons who make this assertion inform us, that caterpillars change their skin, and many of them even several times, previous to the period of their transformation. Transformation, therefore, and a change of integuments by their own concessions, are different things. The truth is, transformation frequently takes place independent of any change of integuments; and there is often a change of the integuments without transformation or any appearance of a new form: but a new form or change of appearance is always implied in metamorphosis or transformation. This new form is sometimes occasioned by a change of shape, consistency, and colour; as when the lobes of a seed are converted into seminal leaves. It is sometimes occasioned

by a change of proportions among the parts: the proportions of a fœtus, every one sees, are different from those of a full grown man; and the painter, merely by observing the proportions, represents a child, a dwarf, and a giant, on the same scale. It is sometimes occasioned by the addition of new organs; as when the emmet receives wings, and the plume of the seed is fed by new roots striking into the ground; or it is occasioned by a change of both the form and the organs, and their mode of operation, as happens remarkably in some insects: for, though all living bodies, plants and animals without exception, undergo partial or general transformations, yet these changes are chiefly observable among insects. Many insects appear to consist of two distinct animal bodies one within the other: the exterior, a creature of an ugly form, residing in the water or under the earth, breathing by gills or sometimes by tracheæ projecting from the tail, possessing a voracious and grovelling appetite, and having a system of sanguiferous vessels that circulates the blood towards the head. When all its parts decay and fall off, the creature inclosed succeeds in its stead: this often is an animal of a different form, generally lives in a different element, feeds on a different species of food, has different instruments of motion, different organs of sense, different organs of respiration, and differently situated; and, being endowed with the parts of generation, inclines to gratify the sexual propensity, and produces an embryo which becomes like the first, and from which afterwards in process of time a creature is evolved similar to itself.

If the embryo or egg be deposited on a leaf, the leaf frequently is observed to bend, to wrap it in folds intended for the purpose, and to protect it from injuries and danger. If deposited in the body of an animal or plant, they accommodate themselves to its wants and necessities, and furnish a tumour which serves it for a nidus, and besides, like an uterus, supplies it with nourishment; and if deposited in the body of an insect, the creature provides for the future destination of its young charge with all the tender care of a parent, and then dies.

These circumstances, added to the great variety of forms which insects assume, render it sometimes difficult to know who is the parent. We cannot, for instance, pronounce with certainty who is the true parent of the gordius, known by the name of the *seta equina*, or hair eel. A set of experiments, which we once began with a view to throw some light on the subject, were interrupted unfortunately by an accident, and we have not since had leisure to resume them. We learned only, from a number of observations, that certain black beetles about the end of the summer months have the strongest propensity to run into the water, where they soon die; and that one or two, and sometimes three or more, of those eels gradually drop from the beetle by the anus. Whether other insects provide for the gordius in this manner we have not yet been able to determine.

The transmutations of some animals are most observable in the uterus and egg: and anatomy has often witnessed the change which happens at birth with respect to circulation, respiration, digestion, and the other functions.

If the reader wish to be much acquainted with the manners and transformations of insects, he will derive information and pleasure from consulting the plates and memoirs of Reaumur. If he wish to know their intimate structure, the laborious Swammerdam can introduce him to a new and amusing species of anatomy. This last author had

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before Reaumur defined and described the kinds of transmutations among insects and some other animals. He was shown similar transmutations in plants; and in plate 46 of his Book of Nature has compared the frog and the clove July-flower under their six different forms.

In all living bodies possessed of mind, the changes of form, as well as the change of habit and of age, are usually accompanied with new propensities, appetites, and passions. It may therefore be inferred, that we ought not to look for the cause of temper in either the brain or the nervous system; or to imagine, that the propensities, appetites, and passions, are properties of mind: they seem only affections happening to mind in consequence of stimuli and organic structure.

Microscopic observations having demonstrated, that all the forms of the plant and animal existed previously in the seed or embryo, transformation must be owing entirely to the evolution of the different parts by means of nutrition.

What nature intends by transformation, we pretend not to say; but by means of transformation different elements are peopled, the different seasons variously adorned, and animated nature wonderfully diversified without a multiplication of beings. For the various races of mankind, see the articles MAN and HOMO.

GENUS III.—Decay and Death.

Death is the cessation and total absence of the living principle in organized bodies. It is sometimes imitated by sleep and swoons; and a state of torpor in many instances can hardly be distinguished from it. Several mosses and a few animals, as the ears of blighted wheat, the seta equina, the wheel polype, and some snails as we learn from the Philosophical Transactions, may be safely preserved as dried preparations, not for months only but for years; and after irritability and sensation have been totally suspended, will return to life upon the proper application of moisture. A wheel polype was put by Fontana upon a bit of glass, and exposed during the whole summer to the noonday sun; another was exposed in a similar manner for a year and a half; and, after they were like a piece of hardened glue, were restored to the use of all their functions by a few drops of water. Wherever there is death, there must therefore be likewise a partial or general decomposition of one or more of the vital organs. This decomposition takes place naturally in some living bodies after a few hours, in some after a few days; the life of others is extended to weeks; some are vigorous for months or a season. Man has often seen more than four-score; and the hardy oak survives the shock of two or three centuries. These observations conspire to show that there is a certain period of existence allotted by nature to every species of living bodies. In the individual this period is sometimes abridged, and may be sometimes extended by circumstances; but yet there is a bound which it cannot pass, when the vital organs must be decomposed, and the system return to moulder with the dust. The time of incubation and the time of gestation are pretty much defined in every species, because the circumstances of the individual in these cases are generally similar; but, after emerging from the foetal state, the individuals are partly entrusted to their own organs and the chances of life, which are much varied; and hence we account for the difference of their age.

Life in general seems to be proportioned to the space occupied by that series of functions which the species is evidently destined to perform: and

here sometimes the accommodating principle is singularly remarkable. As the period of decay is never seen to commence in the species till that of propagation be nearly elapsed, and as propagation in the lower tribes of plants and of animals is often the immediate harbinger of death; so many animals which have not propagated, indulged the propensity, nor become uneasy from the languor of desire, continue vigorous longer than ordinary, as as if it were waiting for an opportunity to multiply their kind. And in the vegetable kingdom, where no individual is ever the victim of desire or passion, annuals, if prevented from flowering and seeding in their proper season, will live double, and sometimes triple, the usual time, till these functions be somehow performed, and then die. But when all the organs are fully evolved and have discharged, or have continued for the usual time capable of discharging, those offices for which they were intended; dissolution commences, the assimilating organs begin gradually to lose their tone, and the re-absorbents carry off more from the different parts than what they receive in the way of nutrition: the irritable fibre then becomes rigid; the membranes and cartilages begin to ossify; the bones grow harder; the smaller vessels collapse and disappear; the parts no longer are obedient, as before, to the action of stimulants; and death ensues.

Some, in order to account for this event, imagine that the body receives at first a certain portion of irritability, and continues to live till that be exhausted: but this theory explains nothing; and without pretending to a great deal of foresight, we will venture to predict, that for all the irritability which it has, it will not be distinguished for its longevity.

With regard to the periods by which the life, the functions, and diseases of living bodies are so frequently regulated, and which periods may sometimes be varied but not evaded, the most prudent language that, perhaps, can be adopted in the present state of physiological science is this of the Divine, That the God who formed us hath numbered our days, determined our times, and prescribed the limits of our existence.

PHYSOCELE. (*physocèle*, φυσοκηλη; from *φύσα*, wind, and *κηλη*, a tumor.) Any species of hernia, whose contents are distended with wind.

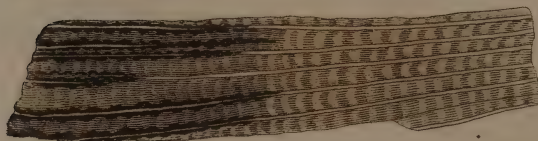
PHYSOCEPHALUS. (*physocephalus*, φυσοκεφαλος; from *φύσα*, wind, and *κεφαλη*, the head.) Emphysema of the head. See **PNEUMATOSIS**.

PHYSOMETRA. (*physometra*, φυσομετρα; from *φύσσω*, to inflate, and *μετρα*, the womb.) A windy swelling of the uterus. A genus of disease in the class cachexiæ, and order intumescentiæ, of Cullen; characterized by a permanent elastic swelling of the hypogastrium, from flatulent distention of the womb.

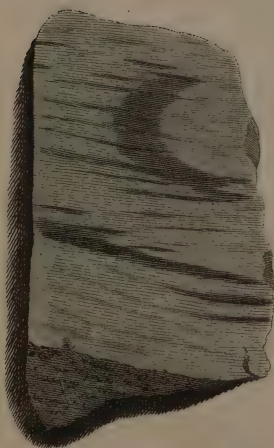
PHYSOPHORA. In zoology, a genus of the class vermes, order mollusca. Body gelatinous, pendent from an aerial vesicle, with gelatinous, sessile members at the sides, and numerous tentacles beneath. Three species, oval-orbicular or filiform. The orbicular, *P. rosacea*, an inch in diameter, and resembling a full-blown flower bending downward. The filiform, *P. filiformis*, a span long, not thicker than a thread, with an obtuse ovate head about the size of a grain of rice. They all inhabit the Mediterranean Sea, and are nearly allied to the medusæ,

Phytoliths.

*Fossil Plants in whole
or in parts.*



*Specimens of
Opaline & Sasperine
Wood.*



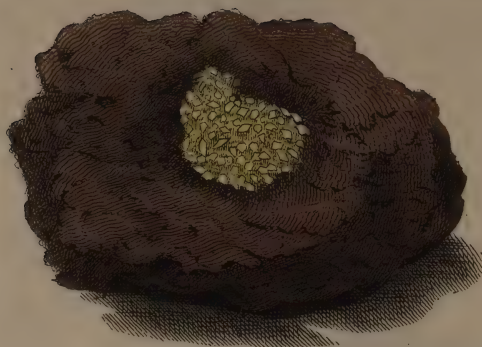
Phytoliths.

Fossil Plants in whole or in part.



Specimens of the Leaves and Stalks of Plants preserved in Fossil Bodies.

Phytolithi.
Fossil Plants in whole
or in parts.



Specimens of Bituminous and Aggrine Wood?

to which genus they might be removed without impropriety.

PHY'SY. *s.* The same with *fusee* (Locke).

PHYTEUMA. *Rampion.* In botany, a genus of the class pentandria, order monogynia. Corol wheel-shaped, five-parted, with linear segments; stigma two or three cleft; capsule two or three celled, inferior, opening laterally. Sixteen species, chiefly natives of the Alps, and warmer parts of Europe; one, *P. orbiculare*, indigenous to our own country, and found wild on the downs of Sussex. Of these some have their flowers in spiked heads, others axillary and scattered.

PHYTIVOROUS. *a.* (*φυτο* and *voros*, Lat.)

That eats grass or any vegetable (*Ray*).

PHYTOGRAPHY. *s.* (*φυτο* and *γραφω*.)

A description of plants.

PHYTOLACCA. *American nightshade.*

In botany, a genus of the class decandria, order decagynia. Calyxless; petals five, resembling a calyx; berry superior, ten-celled, ten-seeded. Six species, natives of Abyssinia, North and South America; one of Switzerland. The following are cultivated,

1. *P. octandra.* White-flowered phytolacca.
2. *P. decandra.* Branching phytolacca.
3. *P. icosandra.* Red phytolacca.
4. *P. dioica.* Tree phytolacca.

In Virginia and other parts of America the inhabitants boil the leaves of *P. decandra*, and eat them in the manner of spinach. They are said to have an anodyne quality, and the juice of the root is violently cathartic. The Portuguese had formerly a trick of mixing the juice of the berries with their red wines, in order to give them a deeper colour; but it was found to debase the flavour. This was represented to his Portuguese majesty, who ordered all the stems to be cut down yearly before they produced flowers, thereby to prevent any farther adulteration.

They afford ornament and variety among potted plants of the stove kind; and *P. decandra* in the borders of the natural ground.

PHYTOLITHUS, in oryctology, a genus of the class petrifications, order vegetable: consisting of a vegetable or some parts of it changed into a fossile substance. Six species:

1. *P. totalis.* The whole plant. The varieties are very numerous: and consist of marshall, iris, sage, various grasses, chervil, fennel, heath, euphorbia, cactus, anemone, geranium, fumitory, vetch, birds-foot, goats-rue, box, milfoil, pine, ferns of numerous kinds. These are found in various parts of Great Britain, France, Germany, Italy, Bohemia, Saxony, and most parts of Europe, generally in schistose and bituminous marl and alumine covering veins of coal, sandstone and other fossils; almost always in the form of impressions. The best impressions of grasses are found in Switzerland, Bohemia, Silesia and other parts of Germany, in schistose swinestone and alumine lying over beds of coal, rarely in flint.

2. *P. phizolithus.* The roots of vegetables, most commonly found under ground in a state of decay, sometimes hollow or filled with

other fossile substances, sometimes covered with a stony crust; sometimes petrified: found in France, Italy, Hungary, Bohemia, Sweden, Siberia, Germany.

3. *P. trunci.* The trunk or stalk of vegetables. The varieties of this species are very numerous; consisting of the stalk of herbs, the culm of grasses; the trunks of trees, often denominated lythoxylon.

This third species is found still more generally than either of the preceding; for without much attention it may be met with in almost every part of the globe, and in various states of decay and appearance; sometimes forming subterraneous woods, the pieces of which are sound or carious, or perforated by the teredo, converted into charcoal, with or without the bark, and often so perfect as to distinguish the kind, as oak, ash, fir, &c.

The different specimens are found in marmoreous and often filled with spar; in swinestone, gypsum, alumine, silex, agate, opal, sandstone, combined with sulphat of iron, or copper, or with oxyd of iron or copper; pyritaceous, and bituminous; in the last form frequently constituting entire subterraneous woods in various parts of England and Ireland, particularly in Lincolnshire; in Russia, Sweden, Denmark, France, Spain, Holland, Flanders, Germany, Prussia, in strata superincumbent on amber; in Saxony, Bohemia, Austria, Italy, and Switzerland.

4. *P. lithophilum.* The leaves of plants. Impressions of the leaves of various herbs and trees very frequent in marble, schist, marl, clay and sandstone, rarely in flint, or indurated oxyd of iron.

5. *P. antholithus.* The flowers of plants. Consisting

a. Of the spikes of grasses, as the phalaris bulbosa, spica frumenti, &c. found in Silesia, Franconia, and Germany, in copper ores, with often a small admixture of silver.

b. The flowers of herbs, as the galium, heliotropium, alsines, ranunculus, myagrum, aster, centaurea, and various ferns. In England, Silesia, Germany, Switzerland, &c. the impressions appearing between various slabby stones.

6. *P. carpolithus.* The naked seeds, seed-vessels, cones, nuts, drupes, and legumes of plants. Found in the coal-mines of England; in sandstone in Piedmont; in Bohemia in marl; in Switzerland in turf; in Hungary, Austria, &c. always in the form of impressions. See Nat. Hist. Pl. CVIII. CXIII. and CXV.

PHYTOLOGY. (*phytologia*, *φυτολογία*; from *φυτο*, an herb, and *λογος*, a discourse.) That part of natural history which treats on plants. See BOTANY.

PHYTOTOMA. In zoology, a genus of the class aves, order passerres. Bill conic, straight, serrate; nostrils oval; tongue short, obtuse; feet four-toed. One species only: *P. rara.* Bill thick, half an inch long, toothed on each side like a saw; irids brown; body above dusky-ash, beneath paler;

quill and tail-feathers spotted with black; tail rounded; hind toe shorter than the foreones. Inhabits Chili; nearly the size of a quail; has a harsh interrupted cry of *Ra, ra*, whence its specific name: feeds on fresh vegetables, which it cuts down near the roots with its bill as with a saw; and is, on this account, a pest to gardens, and detested by the natives; builds in high, shady trees, in retired places; eggs white spotted with red.

PIA-MATER. (*pia mater*, the natural mother; so called because it embraces the brain as a good mother folds her child.) A thin membrane almost wholly vascular, that is firmly accreted to the convolutions of the cerebrum, cerebellum, medulla oblongata, and medulla spinalis. Its use appears to be, to distribute the vessels to, and contain the substance of, the cerebrum.

PIACLE. *s.* (*piaculum*, Latin.) An enormous crime: not used (*Howell*).

PIACULAR. **PIA'CULOUS.** *a.* (*piacularis*, from *piaculum*, Latin.) 1. Expiatory; having the power to atone. 2. Such as requires expiation (*Brown*). 3. Criminal; atrociously bad (*Glanville*).

PIADELLA, a town of Italy, in the duchy of Milan, 20 miles N. of Como. Lon. 9. 10 E. Lat. 46. 5 N.

PIAFFEUR, in the manage, a kind of movement in a proud and stately horse, that, being full of mettle, wishes to go forward; this excessive eagerness makes his motion the greater as you endeavour to keep him in, and bends his leg up to his belly: he snorts, traverses if he can, and by his fiery action shews his restlessness, whence some, though very improperly, say, he dances. Such horses as these, or such as are bred to passage upon a straight line, are much admired in processions and magnificent festivals.

PIANISSIMO. (Ital.) Very soft. The superlative of *Piano*.

PIANO. (Ital.) Soft. A word used adverbially in opposition to *forte*, loud or strong.

PIANO-PIANO, or **PIU PIANO.** (Ital.) More soft, or very soft.

PIANO-FORTE. (Ital.) A very pleasing stringed and keyed instrument of English origin, being invented by Mr. William Mason, the well-known author of *Caractacus* and other poems; it received its name from its varied command within certain limits, both of softness and strength. The chief beauty of this instrument, and which, indeed, constitutes its principal advantage over the harpsichord, is its capacity of obeying the touch, so as to enable the performer to vary and accommodate the expression to all those delicacies, energies, and striking lights and shades which so greatly characterise the more refined compositions of the present day. The Piano-forte, though of recent invention, has received from the hands both of Englishmen and foreigners many useful and valuable improvements; and in that state in which it assumes the name of Grand Piano-forte, and is furnished with its additional keys, is not only qualified to give brilliancy of

effect to sonatas, concertos, and all pieces of extraordinary execution, but forms an expressive accompaniment to the voice, and is one of the noblest and most elegant instruments in the whole compass of musical practice.

PIANOZA, an island of Italy, off the coast of Tuscany, six miles S. of that of Elba. It is level and low, as the name imports. Lon. 10. 34 E. Lat. 42. 46 N.

PIARA, a river which rises in the mountains of Tyrol, and falls into the gulf of Venice, by two mouths, a little N. of Venice.

PIASTER, or **PIASTRE**, a Spanish money, more usually called a *piece of eight*, in value about 4s. 6d. English.

PIAZZA, in building, popularly called *piache*, an Italian name for a portico, or covered walk, supported by arches. The word literally signifies a broad open place or square; whence it also became applied to the walks or porticoes around them.

PIAZZA, a town of Naples, in Principato Citeriore, 13 miles E.N.E. of Salerno.

PIAZZA, a town of Sicily, in Val di Noto. It contains 18,000 inhabitants, and is situate almost in the centre of the island, 15 miles N.W. of Calata Girona.

PIAZZI, the name by which some astronomers designate the planet discovered by M. Piazzi, of Palermo; and of which we have already spoken under the words **ASTRONOMY** and **CERES FERDINANDEA**. Nothing of importance respecting this planet has been discovered since those articles were put to press.

PIB-CORN, or **HORNPIPE**. The name given by the Welsh to a wind instrument, consisting of a wooden pipe with holes at the sides, and a horn at each end, the one to collect the wind blown into it by the mouth, and the other to convey the sound as modulated by the performer. This instrument is so common in Wales, that the shepherds' boys amuse themselves with it while tending their flocks.

PIBROCH, a species of tune peculiar to the Highlands and Western Isles of Scotland. It is performed on a bagpipe, and differs totally from all other music. Its rhythm is so irregular, and its notes, especially in the quick movement, so mixed and huddled together, that a stranger finds it almost impossible to reconcile his ear to it, so as to perceive its modulation. Some of these pibrochs, being intended to represent a battle, begin with a grave motion resembling a march, then gradually quicken into the onset; run off with noisy confusion and turbulent rapidity, to imitate the conflict and pursuit; then swell into a few flourishes of triumphant joy; and perhaps close with the wild and slow wailings of a funeral procession.

PICA, in ornithology. See **CORVUS**.

PICA MARINA, in ornithology. See the articles **HÆMATOPUS** and **ALCA**.

PICA. (*pica*, so named because it is said the magpie is subject to this affection.) Depraved appetite, with strong desire for unnatural food. It is very common to pregnant women.

PICA, or **PYE**, had formerly the same sense as ordinal, meaning a table or directory, point-

ing out the order in which the devotional services appointed for different occasions were to be performed. Accordingly we are told it is derived from *πιτ*, a contraction of *πιναξ*, a table; and by others from *litera picata*, a great black letter at the beginning of some new order in the prayer. The term was used in a similar sense by officers of civil courts, who called their kalendars or alphabetical catalogues, directing to the names and things contained in the rolls and records of their courts, the *pyes*.

PICA, in printing, a particular size of types or letters, larger than long primer. See PRINTING.

PICÆ. In zoology, the second order in the Linnæan class aves; thus ordinarily characterized. Bill sharp-edged, convex above; legs short, strong; feet formed for walking, perching, or climbing; body roughish, impure; food various filthy substances; nest, in trees; the male feeds the female while she is sitting. They live in pairs: twenty-six genera; for which see ZOOLOGY. See also the article ORNITHOLOGY.

PICARD (John), an able mathematician of France, and one of the most learned astronomers of the 17th century, was born at Fleche, and became priest and prior of Rillie in Anjou. Coming afterwards to Paris, his superior talents for mathematics and astronomy soon made him known and respected. In 1666 he was appointed astronomer in the Academy of Sciences: and five years after, he was sent, by order of the king, to the castle of Uraniburg, built by Tycho Brahe in Denmark, to make astronomical observations there; and from thence he brought the original manuscripts, written by Tycho Brahe; which are the more valuable, as they differ in many places from the printed copies, and contain a book more than has yet appeared. These discoveries were followed by many others, particularly in astronomy. He was one of the first who applied the telescope to astronomical quadrants: he first executed the work called *La Connoissance des Temps*, which he calculated from 1679 to 1683 inclusively: he first observed the light in the vacuum of the barometer, or the mercurial phosphorus: he also first of any went through several parts of France, to measure the degrees of the French meridian, and first gave a chart of the country, which the Cassinis afterwards carried to a great degree of perfection. He died in 1682 or 1683, leaving a name dear to his friends and respectable to his contemporaries and to posterity. His works are, 1. A treatise on Levelling. 2. Practical Dialling by calculation. 3. Fragments of Dioptrics. 4. Experiments on Running Water. 5. Of Measurements. 6. Mensuration of Fluids and Solids. 7. Abridgment of the Measure of the Earth. 8. Journey to Uraniburg, or Astronomical Observations made in Denmark. 9. Astronomical Observations made in divers parts of France. 10. *La Connoissance des Temps*, from 1679 to 1683.

All these, and some other of his works, which are much esteemed, are given in the

6th and 7th volumes of the *Memoirs of the Academy of Sciences*.

PICARDY, a late province of France, bounded on the N. by Hainault, Artois, and the straits of Dover, on the E. by Champagne, on the S. by the isle of France, and on the W. by Normandy and the English Channel. It now forms the department of Somme.

PICART (Bernard), an excellent engraver, born at Paris in 1673. He was deemed the most ingenious artist of his day: numerous proofs of his invention and elegance of exertion are to be seen in a multitude of books he adorned. He died in 1733.

PICARO'ON. *s.* (from *picare*, Italian.) A robber; a plunderer (*Temple*).

PIC'PAGE. *s.* (*piccagium*, low Lat.) Money paid at fairs for breaking ground for booths.

PICCOLOMINI (Alexander), archbishop of Patras, and co-adjutor of Sienna, where he was born in 1503. He wrote several dramatic pieces which laid the foundation of his celebrity; all his works are in Italian, and he is the first author who applied that language to philosophical subjects. He died at his native place in 1578.

PICCOLOMINI (Francis), a learned Italian of the same family as the former. He wrote Commentaries on Aristotle; and died at Sienna in 1604. He was so respected that the whole city wore mourning on the occasion of his death.

PICENI, the inhabitants of Picenum, called also Picentes. They received their name from *picus*, a bird by whose auspices they had settled in that part of Italy.

PICENTINI, a people of Italy near Lucania, different from the Piceni or Picentes, who inhabited Picenum.

PICENUM, or PICENUS AGER, a country of Italy near the Umbrians and Sabines.

PICEA. (*picca*, *πικρος*, pitch.) The common or red fir or pitch tree is so termed. The cones, branches, and every part of the tree, affords the common resin called frankincense. See *TEREBINTHINA VULGARIS*.

PICHARIM. See PECHURIM.

To PICK. *v. a.* (*picken*, Dutch.) 1. To cull; to choose; to select; to glean (*Shak.*). 2. To take up; to gather; to find industriously (*Bacon*). 3. To separate from any thing useless or noxious, by gleaning out either part (*Bacon*). 4. To clean, by gathering off gradually any thing adhering (*More*). 5. (*piquer*, Fr.) To pierce; to strike with a sharp instrument (*Wiseman*). 6. To strike with the bill or beak; to peck. 7. (*picare*, Italian.) To rob (*Shakspeare*). 8. To open a lock by a pointed instrument (*Denham*). 9. To PICK a hole in one's coat. A proverbial expression for finding fault with another.

To PICK. *v. n.* 1. To eat slowly and by small morsels (*Dryden*). 2. To do any thing nicely and leisurely (*Dryden*).

PICK. *s.* (*pique*, Fr.) A sharp-pointed iron tool (*Woodward*).

PICKAPACK. *ad.* (from *pack*.) In manner of a pack (*L'Estrange*).

PICKAXE. *s.* (*pick* and *axe*.) An axe not

made to cut but pierce; an axe with a sharp point (*Milton*).

PICKBACK. *a.* On the back (*Hudibras*).

PICKED. *a.* (*piqué*, Fr.) Sharp; smart.

To PICKER. *v. a.* (*piccare*, Italian.) 1.

To pirate; to pillage; to rob (*Ainsworth*). 2.

To make a flying skirmish (*Hudibras*).

PICKER. *s.* (from *pick*.) 1. One who picks or culls (*Mortimer*). 2. A pickaxe; an instrument to pick with.

PICKER, or HORSE-PICKER, an iron instrument five or six inches long, bent or crooked on one side, and flat and pointed on the other, used by grooms to cleanse the inside of the horse's feet, and pick out the earth and sand that has got in between the shoe.

PICKEREL, a small pike.

PICKERING, a town in the N. riding of Yorkshire, with a market on Monday. It has an old castle, in the ruins of which is kept a court for the hearing of all causes under 40 shillings, in the district called the Honour or Liberty of Pickering. It is 26 miles N.E. of York, and 223 N. by W. of London. Lon. O. 38 W. Lat. 54. 15 N.

PICKET, PICKQUET, or PIQUET, in fortification, a painted staff shod with iron; used in marking out the angles and principal parts of a fortification, when the engineer is tracing out a plan upon the ground. There are also larger pickets, or painted stakes, which are driven into the earth to hold together fascines or faggots, in any work cast up in haste. Pickets are likewise the stakes driven into the ground near the tents of the horsemen in a camp, to tie their horses to; and before the tents of the foot, where they rest their muskets or picks about them in a ring. The same name is also given to the stakes with notches towards the top, to which are fastened the cordages of tents: thus to plant the picket is to encamp. When a horseman has committed any considerable offence, he is sometimes sentenced to stand upon the picket, which is to have one hand and the opposite foot tied together, and being drawn up from the ground by the other hand, he is obliged to stand with one foot on the point of a picket or stake, so that he can neither stand nor hang without great pain, nor ease himself by changing feet.

PICKLE. *s.* (*pekel*, Dutch.) 1. Any kind of salt liquor, in which flesh or other substance is preserved (*Addison*). 2. Thing kept in pickle. 3. Condition; state; ludicrously (*Sh.*).

PICKLE, or PIGHTEL. *s.* A small parcel of land enclosed with a hedge, which in some countries is called a *plingle* (*Phillips*).

To PICKLE. *v. a.* (from the noun.) 1. To preserve in pickle (*Dryden*). 2. To season or imbue highly with any thing bad.

PICKLEHERRING. *s.* (*pickle* and *her-ring*.) A jack-pudding; a merry-andrew; a zany; a buffoon (*Addison*).

PICKLOCK. *s.* (*pick* and *lock*.) 1. An instrument by which locks are opened without the key (*Brown*). 2. The person who picks locks.

PICKPOCKET. PICKPURSE. *s.* (*pick* and

pocket, or *purse*.) A thief who steals, by putting his hand privately into the pocket or purse (*Bentley*, *Swift*).

PICKTHANK. *s.* (*pick* and *thank*.) An officious fellow, who does what he is not desired; a whispering parasite (*South*).

PICKTOOTH. *s.* (*pick* and *tooth*.) An instrument by which the teeth are cleaned.

PICO, the largest and most populous of the Azores, or Western Islands. It has a volcanic mountain, called Pico, which frequently throws out flames, smoke and ashes. The island is about 50 miles in circumference, and produces a great deal of wine. Lon. 28. 21 W. Lat. 38. 29 N.

PICQUET, a celebrated game at cards played between two persons, with only thirty-two cards; all the deuces, threes, fours, fives, and sixes being set aside.

In playing at this game twelve cards are dealt to each, and the rest laid on the table: when if one of the gamblers find he has not a court card in his hand, he is to declare that he has *carte blanche*, and tell how many cards he will lay out, and desire the other to discard, that he may shew his game, and satisfy his antagonist, that the *carte blanche* is real; for which he reckons ten. And here the eldest hand may take in three, four or five, discarding as many of his own for them, after which the other may take in all the remainder if he pleases. After discarding, the eldest hand examines what suit he has most cards of; and, reckoning how many points he has in that suit, if the other has not so many in that, or any other suit, he reckons one for every ten in that suit, and he who thus reckons most is said to win the point. It is to be observed, that in thus reckoning the cards, every card goes for the number it bears; as a ten for ten; only all court cards go for ten, and the ace for eleven, and the usual game is one hundred up. The point being over, each examines what sequences he has of the same suit, *viz.* how many tierces, or sequences of three cards; quartes, or sequences of four cards; quintes, or sequences of five cards, &c. he has. These several sequences are distinguished in dignity by the cards they begin from: thus ace, king, and queen, are stiled tierce major; king, queen, and knave, tierce to a king; knave, ten, nine, tierce to a knave; and the best tierce, quarte, or quinte prevails, so as to make all the others in that hand good, and to destroy all those in the other hand. In like manner a quarte in one hand sets aside a tierce in the other.

The sequences over, the antagonists proceed to examine how many aces, kings, queens, knaves, and tens each holds; reckoning for every three of any sort, three; but here, too, as in sequences, he that with the same number of threes or fours has one that is higher than any the other has, makes his own good, and sets aside all his adversary's; but four of any sort, which is called a quatorze, because fourteen are reckoned for it, always set aside three.

The game in hand being thus reckoned, the eldest proceeds to play, reckoning one for every card he plays above nine, while the other

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follows him in the suit: but unless a card be won by one above nine, except it be the last trick, nothing is reckoned for it. The cards being played out, he that has most tricks reckons ten for winning the cards: but if they have tricks alike, neither reckons any thing. If one of them wins all the tricks, instead of ten, which is his right for winning the cards, he reckons forty, and this is called *capot*.

The deal being finished, each person sets up his game; they then proceed to deal again as before; cutting afresh each time for the deal: if both parties are within a few points of being up, the *carte blanche* is the first that reckons, then the point, then the sequences, then the quatorzes, then the tierces, and then the tenth cards. He that can reckon thirty in hand by *carte blanche*, points, quintes, &c. without playing, before the other has reckoned any thing, reckons ninety for them, and this is called a *repike*; and if he reckons above thirty, he reckons so many above ninety. If he can make up thirty, part in hand, and part in play, before the other has told any thing, he reckons for them sixty; and this is called a *repike*; and if he reckons above thirty, he reckons so many above ninety. If he can make up thirty, part in hand, and part in play, before the other has told any thing, he reckons for them sixty: and this is called a *repike*, whence the name of the game. Mr. de Moivre, in his doctrine of chances, has resolved, among others, the following problems: 1. To find, at picquet, the probability which the dealer has for taking one ace or more in three cards, he having none in his hands. He concludes from his computation, that it is 29 to 28 that the dealer takes one ace or more. 2. To find at picquet the probability which the eldest has of taking an ace or more in five cards, he having no ace in his hands. Answer; 232 to 91, or 5 to 2, nearly. 3. To find at picquet the probability which the eldest has of taking both an ace and a king in five cards, he having none in his hand. Answer; the odds against the eldest hand taking an ace and a king are 331 to 315, or 21 to 20 nearly. 4. To find at picquet the probability of having twelve cards dealt to, without king, queen, or knave; which case is commonly called *cartes-blanches*. Answer; the odds against *cartes-blanches* are 1791 to 1 nearly. 5. To find how many different sets essentially different from one another, one may have at picquet before taking in. Answer; 28,967,278. This number falls short of the sum of all the distinct combinations, whereby twelve cards may be taken out of 32, this number 225,792,840: but it ought to be considered, that in that number several sets of the same import, but differing in suit, might be taken, which would not introduce an essential difference among the sets.

The technical terms used in picquet are as follows.

Capot is when either of the players makes every trick for which he scores forty.

Cards signify the majority of tricks, which reckon for ten points.

Carte Blanche means a hand without a court card in the twelve dealt, which counts for ten, and takes place of every thing else.

Huitième eight successive cards of the same suit, counts eighteen points.

Pique is when the elder hand has reckoned thirty in hand, and play before the adversary has gained one; in which case, instead of thirty, it is called sixty, adding thereto as many points as are obtained above thirty.

Point the greatest number on the cards of the same suit in hand, after having taken in, reckoned by their pips, scores for as many points as cards.

Quart four cards in sequence of the same suit counts four points: there are five kinds of quarts, the first called *quart-major*, consists of ace, king, queen, and knave; the second, quart from a king, of king, queen, knave, and ten; the third, quart from a queen, of queen, knave, ten, nine; the fourth, quart from a knave, of knave, ten, nine, eight; the fifth, a *basse-quart* or *quart-minor*, of ten, nine, eight, and seven.

Quatorze the four aces, kings, queens, knaves, or tens, scores fourteen points.

Quint means five cards of the same suit in sequence, and reckons fifteen points: there are four sorts of quints; a *quint-major* of ace, king, queen, knave, and ten, down to knave, ten, nine, eight, and seven, stiled a *quint-minor*.

Repike signifies when one of the players counts thirty or more in hand, before the adversary obtains one, then it is called ninety, reckoning as many points above ninety as were gained above thirty.

Sixième or six cards of the same suit in sequence, reckons for sixteen points: there are three sorts of *sixièmes*, viz. *sixième-major* from the ace, *sixième* from the king, and *sixième* minor from the queen.

Septieme or seven of the same suit in sequence, counts for seventeen points; there are two *septièmes*, one from the ace, the other from the king.

Threes of aces, &c. down to tens, reckon three points.

Talon or *Stock* means the eight remaining cards after twelve are dealt to each player.

Tierce or sequence of three, reckons for three: there are six kinds of tierces, *tierce-major*, of ace, king, queen; down to nine, eight, seven, stiled *tierce-minor*.

The following is the mode of playing the general game as given by Mr. Hoyle.

Play by the stages of your game; that is, when behind your adversary, play a pushing game, otherwise you ought to make twenty-seven points elder-hand, and thirteen points younger-hand; and always compare your game with your adversary's, and discard accordingly.

Discard in expectation of winning the cards, which generally make twenty-two, or twenty-three points difference; therefore don't discard for low quatorze, such as four queens, four knaves, or four tens, because in any of these cases the odds are three to one, elder-hand, and seventeen to three, younger hand, that you do

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not succeed; for if you throw out an ace or a king, you run the risk of losing above twenty points, in expectation of winning fourteen.

At the beginning of a party, play to make your game, which is twenty-seven points elder-hand, and thirteen points younger-hand: suppose you are elder-hand, and have a tierce-major, and the seven of any suit, it is five to two but that you take in one out of any four certain cards; therefore if you have three queens, three knaves, or three tens, discard one of them preferably to the seven of such a suit, because it is 3 to 1 that you do not take in any one certain card, elder-hand, to make you a quatorze, and consequently you would discard the seven to great disadvantage.

If your adversary is considerably before you in the game, the consideration of the cards must be put quite out of the question: therefore suppose you should have a quart to a queen, or to a knave; it is only about 5 to 4, being elder-hand, but that you take in a card to make you a quint, and about 3 to 1 but that you take in a queen, a knave, or ten; and should you have three of either dealt you, push for the game, particularly if it is so far advanced as to give you but little chance in another deal; and in this, and other cases, have recourse to the calculations ascertaining the odds.

Gaining the point, generally makes ten difference; therefore when you discard endeavour to gain it, but do not risk losing of the cards.

Saving of your lurch, or lurching your adversary, is so material, that you ought always to risk some points to accomplish either of them.

If you have six tricks, with any winning card in your hand, play that card; because, at least, you would play 11 points to 1 against yourself by not so doing, unless in play you discover what cards your adversary has laid out.

If you are greatly advanced in the game, as 80 to 50, in that case let your adversary gain two points for one as often as you can, especially if in the next deal you are to be elder-hand; but if on the contrary you are to be younger-hand, and are 86 to 50 or 60, never regard losing two or three points for the gaining of one, because that point brings you within your shew.

The younger-hand is to play upon the defensive; therefore, in order to make his thirteen points, he is to carry tierces, quarts, and especially strive for the point: but suppose him to have two tierces, from a king, queen, or knave, as it is 29 to 23 that he succeeds, he having in that case four certain cards to take in to make him a quart to either of them, and, perhaps, thereby save a pique, &c. he ought preferably to go for that which he has the most chance to succeed in; but if he has three queens, knaves, or tens, and should attempt to carry any of them preferably to the others, the odds that he does not succeed being 17 to 3 against him, he consequently discards to a great disadvantage.

The elder or younger hand should sometimes sink one of his points, a tierce or three kings, queens, knaves, or tens, in hopes of winning

the cards: but that is to be done with judgment, and without hesitating.

It is often good play for a younger hand not to call three queens, knaves, &c. also to sink one card of his point, which his adversary may suppose to be a guard to a king or queen.

The younger-hand having the cards equally dealt him, is not to take in any card, if thereby he runs the risk of losing them, unless he is very backward and has then a scheme for a great game.

If the younger-hand has a probability of saving or winning the cards by a deep discard; as, for example, suppose he should have the king, queen, and nine, and the king, knave, and nine of a suit; in this case he may discard either of those suits, with a moral certainty of not being attacked in them; and the odds that he does take in the ace of either of those suits being against him, it is not worth while to discard otherwise in expectation of succeeding.

The younger-hand having three aces dealt him, it is generally best to throw out the fourth suit.

The younger-hand is generally to carry guard to his queens-suits, in order to make points, and save the cards.

When the younger-hand observes that the elder-hand, by calling his point, has five cards, which will make five tricks in play, and may also have the ace and queen of another suit, he should throw away the guard to the king of the same, especially if he has put out one of that suit, which will give him an even chance of saving the cards.

If the elder-hand has a quart to a king dealt him with two other kings and queens, and is obliged to discard either one of his quart to the king, or a king or queen, the chance for taking in the ace or nine to his quart being one out of two certain cards, is exactly equal to the taking either a king or a queen, having three of each dealt him; therefore he is to discard in such a manner as gives him the fairest probability of winning the cards. This may be a general direction in all cases of the like nature, either for the elder or younger hand.

Suppose the elder-hand has taken in his five cards, and has ace, king, and knave of a suit, having discarded two of the same; and has also the ace, king, knave, and two small cards of another, but no winning cards in the other suits, he then should always play from that of which he has the fewest in number; because, if his adversary proves guarded there, probably he is unguarded in the other; but should the elder-hand lead from the suit of which he has the most, and find his adversary's queen guarded, in that case he has no chance to save or win the cards.

If the elder-hand is sure to make the cards equal, by playing in any particular manner, and is advanced before his adversary in the game, he should not risk losing them; but if his adversary is greatly before him, in that case his interest is to risk losing of the cards, in expectation of winning them.

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The particular rules and cases worth attending to are as follow.

1. Suppose you, elder-hand, have dealt you a quart-major, with the seven and eight of clubs, and king and ten of diamonds, the king and nine of hearts, with the ten and nine of spades; then if you throw out one card of your point, there is a possibility that you reckon only five, and that your adversary may win the cards, by which he gets eleven points, besides his three aces, &c. which gives you a bad chance for the game; but by leaving a card, and admitting that one card of consequence lies in the five which you are entitled to take in, it follows, that you have four chances to one against leaving that particular card, and consequently it is your interest to leave a card: the odds are also greatly in your favour, that you take in some one of the following in your four cards, viz. there are two to your points, three aces, and one king.

2. If you should happen to have the ace, king, and four small cards of any suit, with two other kings, and no great suits against you, the like method of the former case may be practised.

3. Suppose you have the king, queen, and four of the smallest clubs, the king and queen of diamonds, the ace and knave of hearts, and the king and nine of spades, throw out the queen and four small clubs, and carry three entire suits with the king of clubs; for this reason, because the chance for your taking in the fourth king is exactly the same as the chance of taking in the ace of clubs; in either of which cases it is 3 to 1 against you: but if you fail of taking in the fourth king, you by discarding thus, have a fair chance to win the cards, which will probably make twenty-two points difference. But should you discard with an expectation of taking in the ace of clubs, and happen to fail, you being obliged to throw out some of your great cards would have a very distant chance of either saving or winning the cards.

4. Suppose you should have the king and queen of clubs, a tierce-major in diamonds, queen and knave of hearts, and a quint from the knave of spades, throw out the quint from a knave in order to make the most points; because, admit that your quint is good for every thing after you have taken in, you in that case only score nineteen points if you carry it, and you probably give the cards up, and also the chance of the quatorze of queens, besides a great number of points in play.

5. Suppose you have the king, queen, seven, eight, and nine of clubs; the queen and knave of diamonds; the queen, ten, and nine of hearts, with the ace and nine of spades, discard the king, seven, eight, and nine of clubs, and the nine of spades; by which you do not only go for three suits, but have the same chance for taking in the fourth queen, as you would have to take in the ace of clubs; besides, the probability of winning the cards is greatly in your favour.

6. Suppose you have the queen, ten, nine,

eight, and seven of clubs; the knave and ten of diamonds; the king, queen, and knave of hearts, with the ace and nine of spades, discard the five of clubs; because it is 3 to 1 that you do not take in the knave of clubs; and carrying three entire suits gives you a fairer chance to score more points.

7. Suppose you have the ace, queen, and knave of clubs; the king, queen, and knave of diamonds; the queen and knave of hearts with the ten, nine, eight, and seven of spades, discard the ace of clubs and the four spades, because it is only 5 to 4 but that you take in a queen or a knave; it is also about 3 to 2 that you take in an ace: you have also three cards to your tierce to a king to take in, viz. the ace and ten, or the ten and nine, to make you a quint; all which circumstances considered, you have a fair probability of making a great game: whereas, by throwing out the four spades only, you run the risk of leaving one of the following cards, viz. the king of clubs, the ace of diamonds, the ace, queen, or knave of spades; in any of which cases you would probably lose more points than by throwing out the ace of clubs; and if you should carry two suits, viz. three clubs, three diamonds, and the queen of hearts, you run the risk of putting out fourteen points; and it is only 5 to 4 against your taking in a queen or a knave, and therefore you would discard to a great disadvantage.

8. Suppose you have the king, queen, and ten of a suit, and your adversary has the ace, knave, and one small card of the same; and that you have only those three cards left, and are to make three points of them; play the ten.

9. Suppose you have the ace, queen, ten, and nine of clubs, also the king, queen, ten, and nine of diamonds, carry the king, queen, ten, and nine of diamonds; because the chance of taking in the ace or knave of diamonds is exactly equal to that of taking in the king or knave of clubs; by which manner of discarding you may perhaps score fifteen points for your quint in diamonds, instead of four for the quart in clubs: and the chance for winning the cards is better; because, by taking in the ace of diamonds you have seven tricks certain, which cannot happen by taking in the king of clubs.

10. Suppose you have four aces and two kings dealt you younger-hand; in order to capot the elder-hand, make a deep discard, such as the queen, ten, and eight of a suit; by which, if you happen not to take in any card to such suit, you may probably capot the adversary.

11. Suppose elder-hand, that you have the ace, queen, seven, eight, and nine of clubs, also the ace, knave, seven, eight, and nine of diamonds, carry the ace, knave, seven, eight, and nine of diamonds; because taking in the king of diamonds is equal to the taking in the king of clubs, and consequently as good for winning the cards; but you have the chance of taking in the ten of diamonds to make you

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fifteen points, which cannot happen by taking in any one certain card in clubs.

12. Suppose elder-hand, that you have the ace, queen, seven, eight, and ten of clubs, also the ace, knave, seven, eight, and ten of diamonds, carry the ace, knave, seven, eight, and ten of diamonds, for the reasons given in No. 11.

13. Suppose you have the ace, queen, ten, and two more of any suit; also the ace, queen, and ten of another only, and that your adversary has shewn six cards for his point; suppose the ace, queen, and four small ones, and you are guarded in that suit; as soon as you have the lead, play from the suit of which you have the fewest for the reason before stated, because thereby you may obtain the cards; but if your opponent is guarded in both suits, you have no chance to win.

In discarding, it should be observed that, 1. The chance of an elder-hand taking in one certain card, is 3 to 1 against him.

2. That of his taking in two certain cards, is 18 to 1 against him.

3. The odds that an elder-hand takes in four aces, are against him 968 to 1; three of them is about 33 to 1, two of them 3 to 1: one of them 2 to 5.

4. If an elder-hand has one ace dealt him, the odds that he takes in the other three are against him 113 to 1; two of them about 6 to 1; one of them 2 to 3.

5. If an elder-hand has two aces dealt him, the odds that he takes in the other two are against him 18 to 1; one of them is near 5 to 4 against him, or 21 to 17.

6. In case the elder-hand has two aces and two kings dealt, the odds that he takes in either the two aces or two kings, are against him about 17 to 2.

7. Elder-hand having neither ace nor king dealt him, his chance to take in both an ace and a king in two cards, is against him about 11 to 1; in three cards 4 to 1; in four cards 9 to 5; in five cards 33 to 31.

8. The odds that a younger-hand takes in two certain cards are against him 62 to 1. The odds of three certain cards are against him 1139 to 1.

9. The younger-hand having no ace dealt, the chance for his taking one is against him 28 to 29.

10. If the younger-hand has one ace dealt, the odds of taking in two of the three remaining aces are against him about 21 to 1; one of them 3 to 2.

11. The odds that a younger-hand takes in one certain card are against him 17 to 3. The odds of a carte-blanche are against him 1791 to 1.

Laws of the Game of Picquet.—1. The elder-hand is obliged to lay out at least one card.

2. If the elder-hand takes in one of the three cards which belong to the younger-hand, he loses the game.

3. If the elder-hand, in taking his five cards, should happen to turn up a card belonging to the younger-hand, he is to reckon nothing that deal.

4. If the elder or younger-hand plays with thirteen cards, he counts nothing.

5. Should either of the players have thirteen cards dealt, it is at the option of the elder-hand to stand the deal or not, and if he chooses to stand, then the person having thirteen is to discard one more than he takes in; but should either party have above thirteen cards, then a new deal must take place.

6. If the elder or younger-hand reckons what he have not, he counts nothing.

7. If the elder-hand touches the stock after he has discarded, he cannot alter his discard.

8. If a card is faced, and it happens to be discovered, either in the dealing or in the stock, there must be a new deal, unless it be the bottom card.

9. If the dealer turns up a card in dealing, belonging to the elder-hand, it is in the option of the elder-hand to have a new deal.

10. If the younger-hand takes in five cards, it is the loss of the game, unless the elder-hand has left two cards.

11. If the elder-hand calls 41 for his point, which happens to be a quart-major, and it is allowed to be good, and only reckons 4 for it, and plays away, he is not entitled to count more.

12. If the elder-hand shews a point, or a quart, or tierce, and asks if they are good, and afterwards forgets to reckon any of them, it bars the younger-hand from reckoning any of equal value.

13. Carte-blanche counts first, and consequently saves piques and repiques. It also piques and repiques the adversary, in the same manner as if those points were reckoned in any other way.

14. Carte-blanche need not be shewn till the adversary has first discarded; only the elder-hand must bid the younger-hand to discard for carte-blanche: which, after he has done, shew your blanche by counting the cards down one after another.

15. You are to cut two cards at the least.

16. If the elder-hand calls a point, and does not shew it, it is not to be reckoned; and the younger-hand may shew and reckon his point.

17. If you play with eleven cards, or fewer, no penalty attends it.

18. If the elder-hand leaves a card, and after he has taken in, happens to put to his discard the four cards taken in, they must remain with his discard, and he only play with eight cards.

19. If the younger-hand leaves a card or cards, and mixes it with his discard before he has shewn it to the elder-hand, who is first to tell him what he will play, the elder-hand is entitled to see his whole discard.

20. If the younger-hand leaves a card or cards, and does not see them, nor mixes them to his discard, the elder-hand has no right to see them; but then they must remain separate whilst the cards are playing, and the younger-hand cannot look at them.

21. If the younger-hand leaves a card or

cards, and looks at them, the elder-hand is entitled to see them, first declaring what suit he will lead.

22. If the dealer deals a card too few, it is in the option of the elder-hand to have a new deal; but if he stands the deal, he must leave three cards for the younger-hand.

23. In the first place, call your point; and if you have 2 points, if you design to reckon the highest, you are to call that first, and are to abide by your first call.

24. You are to call your tierces, quarts, quints, &c. next; and to call the highest of them, in case you design to reckon them.

25. You are to call a quatorze preferably to three aces, &c. if you design to reckon them.

26. If you call a tierce, having a quart in your hand, you must abide by your first call.

27. Whoever deals twice together and discovers it previous to seeing his cards, may insist upon his adversary dealing, although the latter may have looked at his cards.

28. Should the pack be found erroneous in any deal, that deal is void; but the preceding deals are valid.

29. The player who at the commencement does not reckon or shew carte-blanche, his point, or any sequence, &c. is not to count them afterwards.

30. No player can discard twice, and after he has touched the stock, he is not allowed to take any of his discard back again.

31. When the elder-hand does not take all his cards, he must specify what number he takes or leaves.

32. Whosoever calls his game wrong and does not correct himself before he plays, is not to reckon any thing that game; but the adversary is to reckon all he has good in his own game.

33. Any card that has touched the board is deemed to be played, unless in case of a revoke.

34. If any player names a suit, and then plays a different one, the antagonist may call a suit.

35. The player who looks at any card belonging to the stock is liable to have a suit called.

PICRAMNIA, in botany, a genus of the class dioecia, order pentandria. Calyx three or five-parted; corol three or five-petalled. Female: styles two; berry two-celled; seeds in pairs. Two species; of which *P. antidesmia*, murjoe-bush, is chiefly worthy of notice. It is found frequent in the copses and about the skirts of woods in Jamaica, rising about eight or nine feet from the ground, with alternate, ovate pointed leaves; pendulous and slender flowers on long spikes; florets small and white; berries numerous, at first red, then jet black; pulp soft, purple colour. The negroes make a decoction of the berries, and drink it in dyspepsy and syphilis.

PICRANIA AMARA, or BITTER WOOD, is a tall and beautiful timber tree, common in the woods of Jamaica. It is a new genus, belonging to the pentandria monogynia of Linnéus.

The name is expressive of its sensible qualities. Every part of this tree is intensely bitter: and even after the tree has been laid for floors many years, whoever rub or scrape the wood feel a great degree of bitterness in their mouth or throat. Cabinet-work made of this wood is very useful, as no insect will live near it. This tree has a great affinity to the quassia amara of Linnéus; in lieu of which it is used as an antiseptic in putrid fevers. When used, less of it will do than of the quassia amara of Surinam. See **QUASSIA**.

PICRIS, Ox-tongue. In botany, a genus of the class syngenesia, order polygamia aequalis. Receptacle naked; down feathery, pedicelled; seeds transversely striate; calyx invested with scales. Six species, natives of Japan, Barbary, South of Europe; one, *P. hieracioides*, common ox-tongue, found wild in the borders of our own fields, with yellow blossoms, in most varieties closing soon after noon. It is an agreeable pot-herb while young. The juice is milky and mild.

PICTLAND. See **PENTLAND**.

PICTS, the name of one of those nations who anciently possessed the north of Britain. It is generally believed that they were so called from their custom of painting their bodies; an opinion which Camden supports with great erudition. (See Gough's edition, vol. 1. p. xci. of the preface.) It is certainly liable, however, to considerable objections; for, as this custom prevailed among the other ancient inhabitants of Britain, who used the glastum of Pliny and the vitrum of Mela for the like purpose, it may be asked, Why was the name of *Picti* confined by the Romans to only one tribe, when it is equally applicable to many others? Why should they design them only by an epithet, without ever annexing their proper name? Or why should they impose a new name on this people only, when they give their proper name to every other tribe which they have occasion to speak of? As these questions cannot be answered in any satisfactory manner, it is plain we must look for some other derivation of the name.

The Highlanders of Scotland, who speak the ancient language of Caledonia, express the name of this once famous nation by the term *Pictich*; a name familiar to the ears of the most illiterate, who could never have derived it from the Roman authors. The word *Pictich* means pilferers or plunderers. The appellation was probably imposed upon this people by their neighbours, or assumed by themselves, some time after the reign of Caracalla, when the unguarded state of the Roman province, on which this people bordered, gave them frequent opportunities of making incursions thither, and committing depredations. Accordingly this name seems to have been unknown till the end of the 3d century. Eumenius the panegyrist is the first Roman author who mentions this people under their new name of *Pictich*, or, with a Latin termination, *Picti*. When we say that this name may have been probably assumed for the reason just now mentioned,

we must observe that, in those days of violence, the character of a robber was attended with no disgrace. If he had the address to form his schemes well, and to execute them successfully, he was rather praised than blamed for his conduct; providing he made no encroachments on the property of his own tribe or any of its allies. We mean this as no peculiar stigma upon the Picts; for other nations of antiquity, in the like rude state, thought and acted as they did. See *Thucydides*, lib. 3. p. 3. and *Ving. Æn.* 7. 745—749.

Concerning the origin of the Picts, authors are much divided. Boethius derives them from the Agethyrsi, Pomponius Lætus from the Germans, Bede from the ancient Scythians, Camden and father Innes from the ancient Britons, Stillingfleet from a people inhabiting the Cimbrica Chersonesus, and Keating and O'Flaherty, on the authority of the Psalter Cashel, derive them from the Thracians. But the most probable opinion is, that they were the descendants of the old Caledonians. Several reasons are urged in support of this opinion by Dr. Macpherson; and the words of Eumenes, "Caledonum, aliorumque Pictorum, silvas," &c. plainly imply that the Picts and Caledonians were one and the same people.

As there has been much dispute about the origin of the Picts, so there has been likewise about their language. There are many reasons, however, which make it plain that their tongue was the Gaelic or Celtic; and these reasons are a further confirmation of their having been of Caledonian extract.

The Picts of the earliest ages, as appears from the joint testimony of all writers who have examined the subject, possessed only the east and north-east coast of Scotland. On one side, the ancient Drumalbin, or that ridge of mountains reaching from Lochlomond near Dumbarton to the frith of Taine, which separates the county of Sutherland from a part of Ross, was the boundary of the Pictish dominions. Accordingly we find in the life of Columba, that, in travelling to the palace of Brudius, king of the Picts, he travelled over Drumalbin, the Dorsum Britanniaæ of Adamnan. On the other side, the territory of the Picts was bounded by the Roman province. After Britain was relinquished by the emperor Honorius, they and the Saxons by turns were masters of those countries which lie between the frith of Edinburgh and the river Tweed. We learn from Bede, that the Saxons were masters of Galloway when he finished his Ecclesiastical History. The Picts, however, made a conquest of that country soon after; so that, before the extinction of their monarchy, all the territories bounded on the one side by the Forth and Clyde, and on the other by the Tweed and Solway, fell into their hands.

The history of the Picts, as well as of all the other ancient inhabitants of Britain, is extremely dark, so that we may very well be excused for not dwelling upon it in this place.

PICTS WALL, in antiquity, a wall begun

by the emperor Adrian, on the northern bounds of England, to prevent the incursions of the Picts and Scots. It was first made only of turf strengthened with palisades, till the emperor Severus, coming into Britain in person, built it with solid stone. This wall, part of which still remains, began at the entrance of the Solway Frith in Cumberland, and running north-east extended to the German ocean at Tinmouth. See **ADRIAN** and **SEVERUS**.

PICTORIAL. *a.* (from *pictor*, Lat.) Produced by a painter (*Brown*).

PICTURE. *s.* (*pictura*, Lat.) 1. A resemblance of persons or things in colours (*Shaks.*). 2. The science of painting. 3: The works of painters (*Stillingfleet*). 4. Any resemblance or representation (*Locke*).

To PICTURE. *v. a.* (from the noun.) 1. To paint; to represent by painting (*Shaks.*). 2. To represent (*Spenser*).

PICUMNUS, and **PILUMNUS**, two deities at Rome, who presided over the auspices, that were required before the celebration of nuptials. Pilumnus was supposed to patronize children. The manuring of lands was invented by Picumnus, from which reason he is called Sterquilinus. Pilumnus is also invoked as the god of bakers and millers, as he is said to have first invented how to grind corn. Turnus boasted of being one of his lineal descendants.

PICUS, a king of Latium, son of Saturn, who married Venilia, also called Caneus, by whom he had Faunus. As he was one day hunting in the woods, he was met by Circe, who became deeply enamoured of him, and who changed him into a woodpecker, called by the name of *picus* among the Latins. His wife Venilia was so disconsolate when she was informed of his death, that she pined away.

PICUS. Woodpecker. In zoology, a genus of the class aves, order picæ. Bill angular, straight, wedged at the tip; nostrils covered with recumbent, setaceous feathers; tongue round, worm-shaped, very long, bony, missile, daggered, beset at the point with bristles bent back; tail-feathers ten, hard, rigid, pointed; feet made for climbing.

The birds of this genus climb up and down trees in search of insects, which they transfix and draw out from the clefts of the bark by means of the tongue, which is long at the end, barbed, and furnished with a curious apparatus of muscles, for the purpose of throwing it forward with great force. The life of the woodpecker appears therefore to be harder and less pleasurable than that of most birds. Condemned to this painful toil, he can obtain no food but by boring the bark and hard fibres of trees that inclose it. Thus continually occupied, he enjoys neither relaxation nor rest; and often sleeps in the constrained attitude in which he spent the day. He shares in none of the agreeable sports of the rest of the tenants of the air; he enters into none of their concerts; he utters only savage cries, or plaintive accents, which interrupt the silence of the forest, and express the efforts of a life of fatigue

and of pain. The manners of this bird are suited to its condition : its air is disconsolate ; the traits of its visage harsh. The dispositions of the woodpecker are wild and savage. He flies from society, even that of his mate ; and when forced by the impulse of the sexual appetite to seek a companion, he does it without that graceful address, with which this passion animates creatures of more sensibility.

Such are the condition and habits of the woodpecker. Nature, however, amidst her unkindness, has not denied him instruments suited to his destiny. His legs are strong and muscular ; and the disposition of his toes, of which two are before, and two backward, is fitted for a vigorous adhesion to the trunks of trees where his work lies. His bill, square at the base, but flattened laterally towards the top, like a pair of scissors, is the instrument by which he cuts the trunks of trees, where the insects deposit their eggs. From his bill he darts out his long, round tongue, armed at the top with a sharp bony substance, like a needle ; and with this instrument he stabs and draws out the small worms found in the timber. His nest is constructed of dust, in the cavity which he has dug ; and it is from the heart of the tree that the progeny issues, which is destined to creep around and gnaw it down.

The genus comprises fifty-eight species, scattered over the globe, but chiefly inhabitants of America ; five or six are natives of our own country. We shall select a few specimens.

1. *P. martius*. Great black woodpecker. Black ; cap vermilion. Inhabits our own country, and Europe generally, and found in Chili ; resides chiefly among poplar trees ; builds a large and deep nest, and lays from two to three white eggs ; feeds principally on bees and ants ; from seventeen to eighteen inches long. In the female, the hind-head only is red.

These birds strike with such force against the trees which they excavate, that their noise is heard as far as that of a wood-cutter's hatchet. They sometimes make a large cavity in the interior part of a tree, which weakens it so much, that it falls with the first gale of wind : and hence they often occasion considerable damage to the proprietors of woods.

The bird frequently employs this cavity for a nest : which it makes large and commodious, as may be judged from the heaps of broken chips, which are seen at the foot of the tree which has been thus hollowed out. Aristotle asserts, that none of the woodpeckers ever alight upon the ground ; and it must be admitted, that they are seldom seen there. In winter, birds of this species regularly disappear ; the ants and insects penetrating, in these colder months, into the wood so deeply, that they cannot easily be dug out.

2. *P. principalis*. White-billed woodpecker. Black ; crest scarlet ; line on each side of the neck and secondary quill-feathers white ; bill as white as ivory ; irids yellow ; crest conic ; lower part of the back white. In the female the cap not coloured. Inhabits America from New Jersey to Brazil ; sixteen inches long :

by the Spaniards this species is called the Carpenter-bird, from the peculiar nature of his toils. Like the preceding, he is heard at work at a great distance, and according to Catesby will make a bushel of chips in an hour or two.

3. *P. erythrocephalus*. Red-headed woodpecker. Head wholly red ; wings and tail black ; belly white. In the female the head brown. Inhabits North America ; nine and a half inches long ; migrates, and feeds on acorns, fruits, and Indian corn. Makes the same loud sawing noise when at work as *P. martius* : Catesby affirms that this noise can be heard a mile off. In the winter grows tame, and like the redbreast, will enter houses for food.

4. *P. auratus*. Golden-winged woodpecker. Transversely striate, with black and grey ; chin and breast black ; nape red, rump white ; bill black, round, a little curved ; hind-head and cheeks red ; upper part of the breast with a black lunule ; rest of the breast and belly whitish spotted with black ; back and wing-coverts pale brown with black lines ; first quill-feathers cinereous beneath, and shafts golden ; tail black, edged with white ; legs dusky. Female, chin cinereous. Inhabits North America : eleven inches long ; migrates to Hudson's Bay ; feeds on worms and ground insects, and for want of these, on berries and grass : does not climb trees.

5. *P. viridis*. Green woodpecker. Green : crown crimson. Another variety, with the upper part of the head and spots beneath the ears deep red ; rump pale yellow ; bill dusky, two inches long ; inner circle of the irids reddish, outer white ; temples blackish ; quill feathers dusky with whitish spots ; tail blackish, obscurely barred with green, and tipped with white ; legs greenish-ash. The first inhabits Europe, and is found in our own country ; the second Mexico. Thirteen inches long ; makes a circular hole in the dead parts of trees for its nest ; and lays from five to six greenish eggs spotted with black ; is fond of bees.

6. *P. pubescens*. Downy woodpecker. Back longitudinally downy ; outer tail feathers white with four black spots ; hind head red in the male. Inhabits North America in vast flocks ; is bold, and very injurious to orchards by piercing and destroying the trees : making one hole close to another in a horizontal line, till it has completed a circle of holes all round the tree. Size that of a sparrow.

PID AURA, a town of Turkey in Europe, in the Morea, the ancient Epidaurus. It is situate on the W. coast of the gulf of Engia, 25 miles E. of Napoli-di-Romania. Lon. 23. 22 E. Lat. 37. 40 N.

To PIDDLE. *v. n.* (perhaps from *peddle*.) 1. To pick at table ; to feed squeamishly, and without appetite (*Swift*). 2. To trifle ; to attend to small parts rather than to the main (*Ainsworth*).

PIDDLER. *s.* (from *piddle*.) 1. One that eats squeamishly and without appetite. 2. One who is busy about minute things.

PIE. *s.* 1. Any crust baked with something in it. 2. (*pica*, Latin.) A magpie; a party-coloured bird (*Shakspeare*). 3. The old popish service book, so called from the different colours of the text and rubric. 4. Cock and pie, was a slight expression in *Shakspeare's* time, of which we know not the meaning.

PIEBALD. *a.* (from *pie*.) Of various colours; diversified in colour (*Pope*).

PIECE. *s.* (*piece*, French.) 1. A patch (*Ainsworth*). 2. A part of a whole; a fragment (*Acts*). 3. A part (*Tillotson*). 4. A picture (*Dryden*). 5. A composition; performance (*Addison*). 6. A coin; a single piece of money (*Prior*). 7. **A-PIECE.** To each (*More*). 8. *Of a PIECE with.* Like; of the same sort; united; the same with the rest (*Dryden*).

PIECES, in the military art, include all sorts of great guns and mortars. Battering pieces are the larger sort of guns used as sieges for making the breaches, such are the twenty-four pounder, and culverin, the one carrying twenty-four, and the other an eighteen pound ball. Field pieces are twelve-pounders, demi-culverins, six-pounders, sakers, minions, and three-pounders, which march with the army, and encamp always behind the second line, but in the day of battle are in the front. A soldier's firelock is likewise called his piece.

To PIECE. *v. a.* (from the noun.) 1. To enlarge by the addition of a piece (*Shakspeare*). 2. To join; to unite. 3. **To PIZCE out.** To increase by addition.

To PIECE. *v. n.* To join; to coalesce; to be compacted (*Bacon*).

PIE/CER. *s.* (from *piece*.) One that pieces.

PIE/CELESS. *a.* (from *piece*.) Whole; compact; not made of separate pieces (*Donne*).

PIE/CEMEAL. *ad.* (*piece* and *mel*, Sax.) In pieces; in fragments (*Pope*).

PIE/CEMEAL. *a.* Single; separate; divided (*Government of the Tongue*).

PIED. *a.* (from *pie*.) Variegated; party-coloured (*Drayton*).

PIEDMONT, a principality of Italy, 175 miles long and 40 broad; bounded on the N. by Vallais, on the E. by the duchies of Milan and Montferrat, on the S. by the county of Nicé and the territory of Genoa, and on the W. by France and Savoy. It was formerly a part of Lombardy, but now belongs to the king of Sardinia. It lies at the foot of the Alps, and contains many high mountains, among which are rich and fruitful vallies, as populous as any part of Italy. In the mountains are mines of several kinds, and the forests afford a great deal of game. This country has a great trade in raw silk; and it produces also corn, rice, wine, fruits, hemp, flax, and cattle. Turin is the capital.

PIEDNESS. *s.* (from *pied*.) Variegation; diversity of colour (*Shakspeare*).

PIE/LED. *a.* Bald (*Shakspeare*).

PIENZA, a populous town of Tuscany, in the Siennese, with a bishop's see; 25 miles S.E. of Sienna, and 56 S. of Florence. Lon. 11. 42 E. Lat. 43. 0 N.

PIEPOUDRE (Court of), the lowest, and

at the same time the most expeditious court of justice known to the law of England. It is called piepoudre, (*curia pedis pulverizati*), from the dusty feet of the suitors; or, according to sir Edward Coke, because justice is there done as speedily as dust can fall from the foot; upon the same principle that justice among the Jews was administered in the gate of the city, that the proceedings might be the more speedy, as well as public. But the etymology given us by a learned modern writer is much more ingenious and satisfactory; it being derived, according to him, from *pied pultreaux*, a pedlar, in old French, and therefore signifying the court of such petty chapmen as resort to fairs or markets. It is a court of record, incident to every fair and market; of which the steward of him who owns or has the toll of the market is the judge. It was instituted to administer justice for all commercial injuries done in that very fair or market, and not in any preceding one. So that the injury must be done, complained of, heard, and determined, within the compass of one and the same day, unless the fair continues longer. The court hath cognizance of all matters of contract that can possibly arise within the precinct of that fair or market; and the plaintiff must make oath that the cause of an action arose there. From this court a writ of error lies, in the nature of an appeal, to the courts at Westminster.

PIER, in building, denotes a mass of stone, &c. opposed by way of fortress against the force of the sea, or a great river, for the security of ships lying in any harbour or haven. Such are the piers at Dover, or Ramsgate, or Yarmouth, &c.

PIERS are also used in architecture for a kind of pilasters, or buttresses, raised for support, strength, and sometimes for ornament.

PIERS (Circular), are called massive columns, and are either with or without caps. These are often seen in Saracenic architecture.

PIERS OF A BRIDGE, are the walls built to support the arches, and from which they spring as bases, to stand upon.

Piers should be built of large blocks of stone, solid throughout, and cramped together with iron, which will make the whole as one solid stone. Their extremities, or ends, from the bottom, or base, up to high-water mark, ought to project sharp out with a salient angle, to divide the stream. Or perhaps the bottom part of the pier should be built flat or square up to about half the height of low-water mark, to encourage a lodgment against it for the sand and mud, to cover the foundation; lest, being left bare, the water should in time undermine and ruin it. The best form of the projection for dividing the stream, is the triangle; and the longer it is, or the more acute the salient angle, the better it will divide it, and the less will the force of the water be against the pier; but it may be sufficient to make that angle a right one, as it will render the masonry stronger, and in that case the perpendicular projection will be equal to half the breadth or thickness of the pier. In rivers where large heavy craft

navigate, and pass the arches, it may perhaps be better to make the ends semicircular; for though this figure does not divide the water so well as the triangle, it will better turn off, and bear the shock of the craft. See Hutton's Treatise on Bridges.

To **PIERCE**. *v. a.* (*piercer*, French.) 1. To penetrate; to enter; to force a way into (*Dryden*). 2. To touch the passions; to affect (*Shakspeare*).

To **PIERCE**. *v. n. 1.* To make way by force into, or through any thing (*Bacon*). 2. To strike; to move; to affect (*Shakspeare*). 3. To enter; to dive as into a secret (*Sidney*). 4. To affect severely (*Shakspeare*).

PIERCE (Edward), a painter, eminent in history and landscapes, in the reign of Charles I. He had considerable skill also in architectural designs, but the fire of London in 1666 destroyed most of his works. The late ceiling of Covent-garden church exhibited the excellency of his pencil. He died in London about 1715.

PIERCE (James), a learned non-conformist divine; born at Exeter. He distinguished himself by A vindication of the Protestant Dissenters, published in Latin, in answer to Dr. Nicholls, which was published in English, in 1717. But his greatest work was A commentary on St. Paul's epistles. He died about 1730.

PIERCER. *s.* (from *pierce*.) 1. An instrument that bores or penetrates. 2. The part with which insects perforate bodies (*Ray*). 3. One who perforates.

PIERCINGLY. *ad.* (from *pierce*.) Sharply.

PIERCINGNESS. *s.* (from *piercing*.) Power of piercing (*Derham*).

PIERIA, a small country of Thessaly, said to be the birthplace of the Muses.

PIERIDES, a name given to the Muses, either because they were born in Pieria, in Thessaly, or because they were supposed by some to be the daughters of Pierus, a king of Macedonia, who settled in Boeotia.—Also, the daughters of Pierus, who challenged the Muses to a trial in music, in which they were conquered, and changed into magpies. The victorious Muses perhaps assumed the name of Pierides, in the same manner as Minerva was called Pallas, because she had killed the giant Pallas.

PIERINO, a Tuscan painter, born about 1500. His father was a soldier and his nurse a she goat. He was taken to Rome by a painter of the name of Vaga, from whom he was called del Vaga: while there, he obtained the notice of Raphael, who employed him. The plague drove him from Rome to Florence; but upon Raphael's death, he went back and finished some work left incomplete by that great artist. The prince Doria employed him to paint a palace then building at Genoa, and here it was he made use of cartoons. He died in 1547.

PIERRE LE MOUTIER (St.), a town of France, in the department of Nievre, seated

in a bottom, surrounded by mountains, and near a lake, which renders the air unwholesome, 15 miles N.W. of Moulins, and 150 S. of Paris. Lon. 3. 13 E. Lat. 46. 48 N.

PIERRE (St.), a small desert island near Newfoundland, ceded to the French in 1763, for drying and curing their fish. They were dispossessed of it by the English in 1793. Lon. 56. 0 W. Lat. 46. 39 N.

PIERRE (St.), the capital of Martinico, on the W. side of the island. Lon. 61. 21 W. Lat. 14. 44 N.

PIERSON (Christopher), a Dutch painter, born at the Hague, in 1631, and studied under Bartholomew Maypeny, whom he accompanied to Germany. He painted history and portraits very well, but excelled chiefly in hunting subjects. He died in 1714.

PIERUS, a mountain of Thessaly, sacred to the Muses, who were from thence, as some imagine, called Pierides.—2. A rich man of Thessaly, whose nine daughters, called Pierides, challenged the Muses, and were changed into magpies, when conquered.

PIETAS, a virtue which denotes veneration for the deity, and love and tenderness to our friends. It received divine honours among the Romans, and was made one of their gods. Acilius Glabrio first erected a temple to this divinity, on the spot where a woman had fed with her milk her aged father, imprisoned by the senate, and deprived of all aliments.

PIETISTS, a religious sect sprung up among the protestants of Germany, seeming to be a kind of mean between the quakers of England and the quietists of the Roman church. They despise all sorts of ecclesiastical polity, all school theology, and all forms and ceremonies, and give themselves up to contemplation and the mystic theology. Many gross errors are charged on the pietists, in a book entitled *Manipulis Observationum Antipietisticarum*: but they have much of the air of polemical exaggeration, and are certainly not at all just. Indeed there are pietists of various kinds: some running into gross illusions, and carrying their errors to the overturning of a great part of the christian doctrine, while others are only visionaries; and others are very honest and good, though perhaps misguided, people. They have been disgusted with the coldness and formality of other churches, and have thence become charmed with the fervent piety of the pietists, and attached to their party, without giving into the grossest of their errors. See Mosheim's *Eccles. History*, vol. iv. p. 454.

PIETY. *s.* (*pietas*, Latin; *piété*, French.) 1. Discharge of duty to God (*Peachment*). 2. Duty to parents or those in superiour relation (*Swift*).

PIG, in zoology. See *Sus*.

PIG (Guinea). See *Mus*.

PIG OF LEAD, the eighth part of a fother, amounting to 250 lb. weight.

To **PIG**. *v. a.* (from the noun.) To farrow; to bring pigs.

PIGEON, in ornithology. See *COLUMBA*.

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It is an observation made by a learned naturalist, that the pigeon is one of those birds which, from its great fecundity, has in some measure been reclaimed from a state of nature, and taught to live in habits of dependance. It is true, indeed, its fecundity seems to be increased by human assiduity, since those pigeons that live in their native state, in the woods, are not near so fruitful as those in our pigeon-houses nearer home. The power of increase in most birds depends not only upon the quantity, but also the quality, of their food; many instances may be shown, that man, by a judicious alteration of diet, and supplying food in plenty, and allowing the animal a proper share of freedom, has brought some of those kinds which seldom lay but once a year to become much more prolific.

The beautiful varieties of the tame pigeon are so numerous, that it would be a fruitless attempt to describe them all; for human art has so much altered the colour and figure of this bird, that pigeon-fanciers, by pairing a male and female of different sorts, can, as they express it, breed them to a feather. Hence we have the various names expressive of their several properties, such as carriers, tumblers, pouters, horsemen, croppers, jacobines, owls, nuns, runts, turbits, barbs, helmets, trumpeters, dragons, finnikins, &c. all birds that at first may have accidentally varied from the stockdove; and, by having these varieties still improved by pairing, food, and climate, the different species have been propagated. But there are several species of the wild pigeon which bear a near affinity to the stockdove, yet differ sufficiently from it to require a distinct description. The dove-house pigeon breeds every month; but when the weather is severe, and the fields covered with snow, it must be supplied with food. At other times it may be left to itself, and generally repays the owner for his protection. The pigeon lays two white eggs, which produce young ones of different sexes. When the eggs are laid, the female sits fifteen days, not including the three days she is employed in laying, and is relieved at intervals by the male. The turns are generally pretty regular. The female usually sits from about five in the evening till nine the next morning; at which time the male supplies her place, while she is seeking refreshment abroad. Thus they sit alternately till the young are hatched. When hatched, the young only require warmth for the first three days; a task which the female takes entirely upon herself, and never leaves them except for a few minutes to take a little food. After this they are fed for about ten days with what the old ones have picked up in the fields, and kept treasured in their crops, from whence they satisfy the craving appetites of their young ones, who receive it very greedily.

This way of supplying the young with food from the crop, in birds of the pigeon kind, differs from all others. The pigeon has the largest crop of any bird, for its size; which is also peculiar to its kind. In two that were dissected, it was found, that upon blowing the air into the wind-pipe, it distended the crop, or gullet, to an enormous bulk. This was the more singular, as there did not appear to be the least communication between those two receptacles. By what channel the air passed into the crop, we are wholly ignorant; but we have ocular demonstration, that these birds have a power of swelling the crop with air, and those called crop-

pers distend it in such a manner, that the bird's breast appears larger than its body. The necessity for it in these species is pretty clear, though the mechanism is not known. Pigeons live entirely upon grain and water: these being mixed together in the crop, are digested in proportion as the bird lays in its provision. Young pigeons are very ravenous, which necessitates the old ones to lay in a more plentiful supply than ordinary, and to give it a sort of half-maceration in the crop, to make it fit for their tender stomachs. The numerous glands, assisted by air, and the heat of the bird's body, are the necessary apparatus for secreting a milky fluid; but as the food macerates, it also swells, and the crop is considerably dilated. If the crop were filled with solid substances, the bird could not contract it; but it is obvious the bird has a power of compressing its crop at pleasure, and by discharging the air, can drive the food out also, which is forced up the gullet with great ease. The young usually receive this tribute of affection from the crop three times a day. The male for the most part feeds the young female, and the old female performs the same office for the young male. While the young are weak, the old ones supply them with food macerated, suitable to their tender frame; but as they gain strength the parents give it less preparation, and at last drive them out, when a craving appetite obliges them to shift for themselves; for when pigeons have plenty of food, they do not wait for the total dismission of their young; it being a common thing to see young ones fledged, and eggs hatching, at the same time, and in the same nest.

Though the constancy of the turtle-dove is proverbial, the pigeon of the dove-house is not so faithful, and having become subject to man, puts on incontinence among its other domestic qualities. Perhaps our knowledge of this supposed difference may arise from our greater familiarity with the habits of tame pigeons than of wild ones. Two males are often seen quarrelling for the same mistress; and when the female encourages the freedoms of a new gallant, her old companion shows visible marks of his displeasure, quits her company, or if he approach, it is only to chastise her. Many instances have been known where two males being dissatisfied with their respective mates, have thought fit to make an exchange, and have lived in peace and friendship with the new objects of their choice. So rapid is the fertility of this bird in its domestic state, however incredible it may appear, that from a single pair fourteen thousand seven hundred and sixty may be produced in the space of four years. The stock-dove, however, very rarely breeds more than twice a year: for, as the winter months approach, their whole employ is for self-subsistence, so that they cannot transmit a progeny. But their attachment to their young is much stronger than in those which breed often. This is owing, perhaps, to their affections being less divided by so great a number of claims.

Pigeons are very quick of hearing, have a very sharp sight, and when pursued by the hawk or kite, and are obliged to exert themselves, are exceedingly swift in flight. It is the nature of pigeons to love company and assemble in flocks, to bill in their courtship, and to have a plaintive note.

Mr. Duhamel asserts, "that pigeons do not feed upon the green corn, and that their bills have not strength enough to search for its seed

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in the earth; but only pick up the scattered grains, which would be parched up by the heat of the sun, or infallibly become the prey of other animals." He further adds, "that from the time of the sprouting of the corn, pigeons live chiefly upon the seeds of wild uncultivated plants, and therefore considerably lessen the quantity of weeds that would otherwise encumber the ground; as is evident from a just estimate of the quantity of grain necessary to feed all the pigeons of a well-stocked dove-house." But the facts alleged by Mr. Worlidge and Mr. Lisle, in support of the contrary opinion, are incontrovertible. Mr. Lisle relates that a farmer of his acquaintance, who was a man of strict veracity, assured him he had been witness to an acre sowed with peas, which the wet weather prevented being harrowed in, and every pea had been taken away in half a day's time by a flock of pigeons; and Mr. Worlidge says, "It is to be observed, that, where the flight of pigeons fall, there they fill themselves and away, and return again where they first rose, and so proceed over a whole piece of ground, if they like it. Although you cannot perceive any grain above the ground, they know how to find it, and consequently commit great depredations on the property of the farmer."

The following are the names and characters of the most esteemed pigeons.

The English powder.—This bird derives its name from having been originally bred in England, and is a cross breed between a horseman and a cropper. The frequency of pairing its young ones with the cropper has added great beauty to this bird, and raised its value among the fanciers.

Those composed of different colours are most esteemed, as the blue-pied, black-pied, red-pied, and yellow-pied. All these properties rise in estimation, according as they are more or less beautifully variegated.

The Dutch cropper.—This pigeon was originally bred in Holland; the body is thick, clumsy, and short, as are also the legs, which are feathered down to the feet: they have a large pouch or bag hanging under their beak, which they can swell with wind, or depress, at pleasure; their crop hangs low, but is very large; they are so loose-feathered on the thighs, as to be styled flag-thighed; they seldom play upright, and stand wide on their legs; they are gravel-eyed, and such bad feeders of their young, that, as soon as they have fed off their soft meat, it is necessary to place their young under a pair of small runts, dragons, or powting horsemen, who will rear them with more care than their real progenitors.

The uploper.—This is also a native of Holland; it nearly resembles the English powder in all its properties, only that it is smaller; it has a round crop, in which it generally hides its bill; it has small slender legs, with its toes short and close together, on which it trips so exactly, when walking, as to leave the ball of the foot quite hollow; it plays very upright, is close thighed, and has a custom on approaching the hen of leaping to her with the tail spread, whence the name uploper is derived.

The Parisian powder.—Though brought into England from Brussels, this is originally a native of Paris; it partakes of the nature of the English powder, though it is not so well made; its body and legs are short; it has generally a long, but not a large, crop; and is thick in the girth.

The powting horseman.—This is what the growers term a bastard-bred pigeon, and is produced between the horseman and the cropper; and, agreeably to the number of times that their young ones are bred over to the cropper, they have the appellation of first, second, or third breed; and the more frequently this method is practised, the greater is the improvement the crop receives from it.

The carrier.—These are rather larger than most of the common-sized pigeons; their feathers lie very close, even, and smooth; their flesh is naturally firm, and their necks long and straight; so that when they stand upright on their legs, they show an elegant gentility of shape far exceeding most other pigeons, who in such a posture cringe themselves up in an uncouth manner. From the lower part of the head to the middle of the lower chap there grows out a white, naked, fungous flesh, which is called the wattle, and is generally met by two small protuberances of the same luxuriant flesh, rising on each side of the under chap; this flesh is always most valued when of a blackish colour.

The circle round the black pupil of their eyes is commonly of a red brick-dust colour, though they are more esteemed when it is of a fiery red; these are also encompassed with the same sort of naked fungous matter, which is very thin, generally of the breadth of a shilling, and the broader this spreads, the greater is the value set upon them; but when this luxuriant flesh round the eye is thick and broad, it denotes the carrier to be a good breeder, and one that will rear very fine young ones. The pigeon-fanciers are unanimous in giving this bird the title of "king of the pigeons," on account of its graceful appearance and uncommon sagacity.

Extraordinary attention was formerly paid to the training of these pigeons, in order to their being sent from the garrison of a besieged city to generals that were coming to succour it: or from princes to their subjects with the news of some important transaction. In this country these aerial messengers have been made use of for a very singular purpose, being let loose at places of execution, at the moment the fatal cart was drawn away, to notify to distant friends the exit of the unhappy criminal; just as when some hero was to be interred, it was a custom among the ancient Romans to let fly an eagle with the funeral pile, to make his apotheosis complete.

In order to train a pigeon for this purpose, take a strong full-fledged, young carrier, and convey it in a basket or bag about half a mile from home, and there turn it loose; having repeated this two or three times, then take it two, four, eight, ten, or twenty miles, and so on till they will return from the remote parts of the kingdom. For if they be not practised when young, the best of them will fly but insecurely, and stand a chance of being lost: be careful that the pigeon intended to be sent with the letter is kept in the dark, and without food, for about eight hours before it is let loose, when it will immediately rise, and turning round, as is their custom, will continue on the wing till it has reached its home.

The horseman.—This bird is in shape and make very like the carrier, only less in all its properties, its body smaller, its neck shorter; neither is there so much luxuriant encrusted flesh upon the beak, and round the eye, so that the distance between the wattle and the eye is much more conspicuous.

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in this pigeon than in the carrier. They are also more subject to be barrel-headed and pinch-eyed. This species of the pigeon is decorated with a variety of colours; but the most distinguished are the blue and blue-pieds, which generally prove the best breeders. These pigeons, especially when young, should be regularly flown twice a day, and as they gain strength, should be let loose and put on the wing without any other in company, and they will fly four or five miles distance, in a few minutes, sweeping over a very large circuit. This is what the fanciers term going an end: this method is of essential service to them, especially when they are in training. This is the sort of pigeon chiefly made use of in this country, for deciding bets or conveying letters. The true genuine carriers are at this time very scarce, and of too great a value to be flown, except upon great emergencies. There is another species called the

Dragon.—It is bred between a tumbler, and a horseman, and the ablest fanciers are unanimous in their opinions, as to its being of a bastard-strain, and that by frequently matching their breed to the horseman, they will acquire great strength and agility. This pigeon is an excellent breeder, and makes a very tender nurse; for which purpose they are frequently kept as feeders for rearing of young powters, Leghorn-runts, and some other pigeons, who either breed so fast that they cannot conveniently give their young ones due attendance, or are destitute of that natural fondness which is the characteristic of this bird.

The tumbler.—These pigeons by their flight afford great amusement, for besides their tumbling, they will frequently rise to such an amazing height in the air as to be almost imperceptible to the keenest eye; and there is one peculiar property belonging to them, which is, that they will not ramble far like the horsemen, but if good birds, and familiarised to each other, will keep such close company, that a flight of a dozen may be covered with a handkerchief. At this height, especially if the weather be warm and clear, they will continue upon the wing for four or five hours at a stretch; it is reported that some well-bred pigeons of this sort have flown for nine hours successively, when they have been up at their highest pitch; the favourite sort seldom or never tumble but when they are beginning to rise, or when they are coming down to pitch.

The almond tumbler.—This is a very beautiful and valuable species, and derives its origin from the common tumblers, (which it so resembles in shape and make as to render any description unnecessary). By being judiciously matched, the feathers become very elegantly variegated with yellows, duns, whites, blacks, black-grizzled, black-splashed, &c.

The Leghorn runt.—This is a noble, large, full-bodied pigeon; it is close feathered, short in the back, very broad-chested, and frequently measures seven inches and a quarter in the length of its legs; when it walks, it carries its tail raised up like a duck's, but hangs it down when it plays. It is goose-headed, and hollow-eyed, with a longer neck than any other pigeon, which it carries bending like a goose; the eye is encircled with a thin skin, broader than that of the Dutch tumbler; the beak is very short, with a small wattle over the nostril, and the upper chap projects a little over the under.

The Spanish runt.—Is a short, thick-legged, flabby-fleshed, loose-feathered bird, with a remark-

ably long body; some of them measuring twenty-three inches in length from the apex of the beak to the extreme end of the tail; and it does not carry itself so upright as the Leghorn runt. The feathers of this variety are so uncertain, and of such a multiplicity of colours, that a judgment cannot be formed of the sort by the colour, though some of the best are reported to be of a blood-red or mottled hue.

The runt of Friesland.—This bird is somewhat larger than a middle-sized runt; its feathers are all inverted, and stand the wrong way: if this pigeon have its fanciers, it must be because it is uncommon and disgusting. It is at present very scarce in this country.

The trumpeter.—This pigeon is nearly as big as a middle-sized runt, and very like it in shape and make; its legs and feet are covered with feathers, the crown of its head is very round, like that of the finnikin and nun, only larger; and the larger the head is the more it is esteemed, as being usually more melodious; it is in general pearl-eyed, and black mottled in its feathers; but the surest mark to distinguish a good trumpeter is the tuft of feathers which sprout from the root of the beak, and the larger this tuft grows the greater is the value set upon the bird. The more salacious it is, the more it will trumpet: it derives its name from its imitating the sound of a trumpet, after playing, which it always does in the spring of the year.

This bird and the ensuing species of pigeons are called toys by amateurs.

The spot.—It has its name from a spot above its beak upon the top of its head; the tail-feathers are for the most part of the same colour with the spot, but the body is generally all white.

The laughter.—This bird in shape and make very much resembles a middle-sized runt; its plumage is generally red-mottled, but sometimes blue, and it has a very bright clear pearl eye, inclining to white.

The nun.—Its head is almost covered with a veil of feathers, whence its name. Its body is chiefly white; its head, tail, and the six flight-feathers of its wings, should be entirely red, yellow, or black: that is, when its head is red its flight and tail should be red also; and when its head is yellow its flight and tail should be yellow; and when its head is black its flight and tail should also be of this last colour.

The hermit.—Is sometimes larger than the nun; the head, tail, and flight-feathers of the wings, for the most part preserve an uniformity of colour, either yellow, red, blue, or black; but all the rest of its body is generally white; so that the most material difference between it and the nun is, that the former has no hood on the back part of the head, and is frequently gravel-eyed.

The jacobine.—This is usually called, for shortness, the jack; it has a range of inverted feathers on the back part of the head, which turns toward the neck, like the cap or cowl of a monk, whence this bird derives its name of jacobine, or capper, as some call it; the religious of that order wearing cowls or caps, joined to their garments, for the purpose of covering their heads.

The ruff.—The ruff has a longer beak, and larger head; it is also rather a larger pigeon than the last; the irids of its eyes are in some of a gravel, in others of a pearl colour; the chain does not flow so near to the shoulders of its wings, though both the hood and chain are longer, but are nothing like so compact as the

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others, and are easily disturbed with every puff of wind; they likewise fall more backward from the head, in a rumpled discomposed form, and from this the pigeon receives its name.

The turbit.—This is a small pigeon, very little bigger than a jacobine: it has a round button head, and the shorter the beak is the better; it has a tuft of feathers growing from the breast, which opens and spreads both ways, sprouting out like the chitterlin of a shirt; this is called the purle; it has also a gullet which reaches from the back to the purle: this bird is admired according to the largeness of its purle.

The owl.—Is rather less than a jacobine, with a gravel eye, and a very short hooked beak, much resembling that of an owl, and from this the bird derives its name. The purle in this bird is rather larger, and opens and expands itself more like a rose than that of the turbit's; but in every other respect, both in shape, make, and plumage, this bird is so very like the turbit, the beak excepted, as to render any further description needless.

The capuchin.—A pigeon which has its name from an order of barehead monastics: it has a longer beak than the jack, and is somewhat larger in its body; it has no chain, but a very pretty hood, and is in plumage and other properties the same as the jack. Some fanciers positively affirm it to be a distinct species; others again as confidently affirm it to be a bastard breed, between a jacobine and some other pigeon; however it is beyond a doubt, that a jack and another pigeon will breed a bird so exactly similar to it, as will greatly embarrass the fanciers of this first persuasion to distinguish between it and what they term their separate species. Though all the pigeons of the toy kind have their respective admirers, the capuchin is but lightly esteemed by amateurs in general.

The finnikin.—In make, shape, and size, this differs very little from the common runt; the crown of its head is formed very like the head of a snake; it has a gravel eye, with a tuft of feathers growing on the back part of its crown, which falls down its neck, hanging like a horse's mane; it has a clean leg and foot, and its plumage is always blue or black-pied.

The turner.—Is in so many respects like the finnikin, that little more remains to be said about it: than to point out the difference between them it is not snake-headed, and the tuft on the back part of the crown is wanting; and when the wanton fit is on it and it plays to the female, it turns only one way, while the finnikin turns both.

The broad tail shaker.—This pigeon, especially when lustful, has a frequent tremulous motion, or shaking in the neck; which, joined to the breadth of its tail when spread, gives the bird the name of the broad-tail shaker.

It has a beautiful long taper neck, which it erects in a serpentine form, rather leaning towards its back, somewhat like that of the swan. Its beak is very short; it is exceedingly full breasted, and has a tail that is composed of a great number of feathers, very seldom less than four and twenty, but never exceeding six and thirty, which it spreads in a very striking manner, like the tail of a turkey-cock, and raises it up to such a degree, that the tail appears joined to the head.

The narrow tail shaker.—This is a bastard strain between the broad tail shaker and some other pigeon; it has a longer back and shorter neck

than that of the last-mentioned bird: it has also a less number of feathers in its tail, which it does not spread like the former, but lets them fall, as it were, double, the oneseide folding over the other, in the manner of a fan when three parts opened, and is apt to let it droop very much.

The barb.—This bird is rather larger than the jacobine; it has a short thick beak, like a bullfinch, encrusted with a small wattle, and a naked circle of a thick spongy red skin round its eyes, like that of the carrier; when the feathers of the pinion are inclinable to a dark colour, the irids are red, as is observable in some others of the pigeon tribe.

The mahomet.—Differs from the barb in nothing but the colour, which is of a fine white. In other respects it bears a strong resemblance.

The lace pigeon.—This is about the size of the common runt, and not unlike it in shape, but the colour of its plumage is white.

The frill back.—This is less than the common runt, though very much like it in shape. The plumage of this bird is also white.

The smiter.—This pigeon, in shape, make, and diversity of plumage, nearly resembles the tumbler, the size excepted, it being a much larger bird.

The Chinese pigeon.—This bird in size is rather less than the common swallow; the sides of the head are yellow, but the top and the space round the eye are of an ash colour; it has a blueish ash-coloured beak, and the irids of its eyes are a fine white.

Diet proper for pigeons.—The common dove-house pigeon, being removed as it were but one step from a state of nature, is hardy, and will seek its own food, living upon almost any grain; yet it is far different from the fancy-birds, who require some attention, and are much more delicate.

These pigeons should be indulged with such grains as wheat, barley, oats, peas, horsebeans, vetches, tares, rape, and canary, or hemp-seed. But of all grains old tares prove to be the best suited to their nature; new tares should be given very sparingly, especially to young pigeons, as they are very liable to give them a scouring, though old tares will have the same effect, if by any accident they have been mixed with salt, or damaged by sea-water; for though pigeons are very fond of salt, too much is pernicious.

Horsebeans are esteemed the best food next to tares, but the smaller these are the better: there is a French sort called small ticks, which make good food; but we would advise those who feed their pigeons with beans sometimes to mix a few vetches with them, and to have all the beans split.

Wheat, barley, oats, and peas, ought only to be given occasionally as a change of diet, since they are very subject to scour them. There is a mixed diet made of tares, beans, and peas, which is called Scotch meat, with which some fanciers feed their pigeons for cheapness, but care should be taken that the beans are not too large. Rape and canary, and hemp-seed, is a diet that pigeons are immoderately fond of; yet this, for many reasons, ought not to be employed as a constant diet.

Pigeons are protected by the legislature. By the 1 James, c. 27. whosoever shall shoot at, kill or destroy, any dove or pigeon, with any gun or bow, or take, kill, or destroy the same with setting-dogs or nets, or any snares, engines, or in-

struments whatsoever, shall, on being convicted, before two justices, by confession, or oath of two witnesses, be committed to gaol for three months, or pay for the use of the poor 20s. for every pigeon; or, after this commitment, become bound by recognizance, with two sureties, before two justices, in 20l. each, not to offend in like manner again.

And by the 2d Geo. 3. c. 29. any person who shall shoot at, or by any means kill or take, with a wilful intent to destroy, any pigeon, he shall on conviction thereof, by confession, or oath of one witness, before one justice, forfeit 20s. to the prosecutor; and if not immediately paid, such justice shall commit him to the house of correction, for any term not exceeding three months, nor less than one, unless the penalty be sooner paid. Persons who are convicted on this act shall not be convicted by any former act, and prosecutions on this act must be commenced within two months after the offence was committed.

These two abstracts are given to inform the keepers of pigeons of the laws in force to protect them; but more especially to remove the vulgar error so prevalent among the lower class of people, that pigeons are a nuisance, that they destroy a great deal of seed in the fields, grain in the rick-yards, and loosen the tiles on the tops of buildings; and that any person may shoot them, provided that he does not carry them away. The above acts are unrepealed, and in full force: consequently every offender is liable to the punishments therein specified. See COLUMBA.

PIGEON ISLAND, a small island, eight miles from the coast of Malabar, and 15 from the town of Onore. Lon. 74. 6 E. Lat. 14. 1 N.

PIGEON PEA, in botany. See **PITISUS**.

PIGGIN. s. A small wooden vessel.

PIGHT, old pret. and part. pass. of *pitch*. Pitched; placed; fixed; determined (*Shakespeare*).

PIGMENT. (*pigmentum*, from *pingo*, to paint.) This name is given by anatomists to a mucous substance found in the eye, which is of two kinds. The pigment of the iris is that which covers the anterior and posterior surface of the iris, and gives the beautiful variety of colour in the eyes. The pigment of the choroid membrane is a black or brownish mucus which covers the anterior surface of the choroid membrane, contiguous to the retina and the interior surface of the ciliary processes.

PIGMENTS, in the arts, are preparations in a solid form, chiefly employed by painters, for imitating particular colours, and imparting them to the surface of bodies. They are obtained from animal, vegetable, and mineral substances: the latter are the most durable. See COLOURS.

PIGMY, in mastiology. See **SIMIA**.

PI'GMY. s. (*pygmaeus*, Latin.) A small nation, fabled to be devoured by the cranes; thence any thing mean or inconsiderable (*Garth*).

PIGNORATION. s. (*pignora*, Lat.) The act of pledging.

PIG NUT. Earth nut. Ground nut. The bulbous root of the bunion bulbocastanum of Linnæus. Pignuts, so called because

the pig is very fond of them, and will dig with its snout to some depth for them, are of a dirty brown colour, a little bigger than a hazel-nut, and flavoured like the chesnut. They are said to possess a styptic quality, and are deemed serviceable in laxity of the kidneys.

PIGSNEY. s. (*piza*, Sax. a girl.) A word of endearment to a girl.

PIGWIDGEON. s. A cant word for any thing petty or small (*Claveland*).

PIKE, an offensive weapon, consisting of a shaft of wood, twelve or fourteen feet long, headed with a flat-pointed steel, called the spear. The pike was a long time in use among the infantry, to enable them to sustain the attack of the cavalry, but it is now taken from them, and the bayonet, which fixes on at the end of the carbine, is substituted in its place. Yet the pike still continues the weapon of the sergeants, who fight pike in hand, salute with the pike, &c.

PIKE, in ichthyology. See **ESOX**. The pike usually a still, shady, unfrequented water, and usually lies amongst or near weeds; such as flags, bulrushes, candocks, reeds, or in the green fog that sometimes covers standing waters, though he will sometimes shoot out into the clear stream.

Pike are angled for in various ways: the two following, denominated trolling, and snapping, are the most common.

Let your line be of green or sky-coloured silk, thirty yards in length, which will make it necessary to use the winch, with a swivel at the end.

The usual trolling hook for a living bait consists of two large hooks, with one common shank, made of one piece of wire, of about three-quarters of an inch long, placed back to back, so that the points may not stand in a right line, but incline so much inwards as that with the shank they may form an angle little less than equilateral. At the top of the shank is a loop left in the bending the wire, to make the hook double, through which is put a strong twisted brass wire of about six inches long: and to this is looped another such link, but not so loose that the hook and the lower link may have room to play: to the end of the line fasten a steel swivel.

But there is a sort of trolling-hook different from this, which is thought preferable, and will require another management; this consists of two single hooks tied back to back with a strong piece of gimp between the shanks; in the whipping the hooks and the gimp together, make a small loop, and take into it two links of chain of about an eighth of an inch in diameter; and into the lower link, by means of a small staple of wire, fasten near the greater end a bit of lead of a conical figure, and somewhat sharp at the point. These hooks are to be had at any fishing-tackle shops ready prepared.

This latter kind of hook is to be thus ordered: put the lead into the mouth of the bait-fish, and sew it up; the fish will live some time, and, though the weight of the lead will keep

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his head down, he will swim with nearly the same pliancy as if at liberty.

But if you troll with a dead bait, as many do because a living bait makes too great a slaughter among the fishes, do it with a hook of the following contrivance.

Let the shank be about six inches long, and leaded from the middle as far as the bent of the hook, to which a piece of very strong gimp must be fastened by a staple, and two links of chain; the shank must be barbed like a dart, and the lead a quarter of an inch square; the barb of the shank must stand like the fluke of an anchor, placed in a contrary direction to that of the stock. Let the gimp be about a foot long, and to the end fix a swivel: to bait it, thrust the barb of the shank into the mouth of the bait-fish, and bring it out at the side near the tail: when the barb is thus brought through, it cannot return, and the fish will lie perfectly straight, a circumstance that renders the trouble of tying the tail unnecessary.

There is yet another sort of trolling-hook, which is the common hook, of which those already mentioned are improvements. This is a hook either single or double, with a long shank, leaded about three inches up the wire with a piece of lead about a quarter of an inch square at the greater or lower end; to the shank is fixed an armed wire about eight inches long. To bait this hook thrust your wire into the mouth of the fish, quite through his belly, and out at his tail, placing the wire so as that the point of the hook may be even with the belly of the bait-fish, and then tie the tail of the fish with strong thread to the wire: some fasten it with a needle and thread, which is a neat way.

Both with the troll and at the snap, cut away one of the fins of the bait-fish close to the gills, and another behind the vent on the contrary side, which will make it play the better.

The bait being thus fixed, is to be thrown into the water, and kept in constant motion, sometimes suffered to sink, then gradually raised; now drawn with the stream, and then against it, so as to counterfeit the motion of a small fish in swimming. If a pike be near, he mistakes the bait for a living fish, seizes it with prodigious greediness, goes off with it to his hold, and in about ten minutes pouches it. When he has thus swallowed the bait you will see the line move, which is the signal for striking him; do this with two strong jerks, and then play him.

The method of fishing with the snap is as follows:

Let the rod be twelve feet long, very strong and taper, with a strong loop at top to fasten your line to; your line must be about a foot shorter than the rod, and much stronger than the trolling line. This mode of fishing is pursued both with the live and the dead snap.

For the live snap there is no kind of hook so proper as the double-spring hook. To bait it, nothing more is necessary than to hang the bait-fish fast by the backfin to the middle-hook, where he will live a long time.

Of hooks for the dead snap there are many kinds: that prepared as follows is most esteem-

ed. Whip two hooks, of about three-eighths of an inch in the bent, to a piece of gimp in the manner directed for the trolling-hook. Then take a piece of lead of the same size and figure as directed for the trolling-hook above mentioned, and drill a hole through it from end to end; to bait it, take a long needle, or wire, enter it in at the side, about half an inch above the tail, and with it pass the gimp between the ribs and skin of the fish, bring it out at its mouth; then put the lead over the gimp, draw it down into the fish's throat and press his mouth close, and then, having a swivel to your line, hang on the gimp.

In throwing the bait observe the rules for trolling; but remember, that the more you keep it in motion, the nearer it resembles a living fish.

When you have a bite, strike immediately the contrary way to that in which the head of the pike lies, or in which he swims with the bait; if you cannot find which way his head lies, strike upright with two smart jerks, retreating as fast as you can, till you have brought him to a landing-place, and then do as before directed.

As the pike spawns in March, and before that month rivers are seldom in order for fishing, it will hardly be worth while to begin trolling till April; and after that time the weeds will be apt to be troublesome. But the prime month in the year for trolling is October, when the pikes are fattened by their summer's feed, the weeds are rotted, and by the falling of the waters the harbours of the fish are easily found.

Prefer to troll in clear, and not muddy, water, and in windy weather, if the wind be not easterly.

Some use in trolling and snapping two or more swivels to their line, by means of which the twisting of the line is prevented, the bait plays more freely, and, though dead, is made to appear as if alive; which, in rivers, is doubtless an excellent way: but those who like to fish in ponds or still waters will find very little occasion for more than one.

The pike is also to be caught with a minnow, for which method take the following directions:

Get a single hook, slender, and long in the shank; let it resemble the shape of a shepherd's crook; put lead upon it, as thick near the bent as will go into the minnow's mouth; place the point of the hook directly up the face of the fish; let the rod be as long as you can handsomely manage, with a line of the same length, cast up and down, and handle it as when you troll with any other bait: if when the pike has taken your bait, he run to the end of the line before he hath gorged it, do not strike, but hold still only, and he will return back and swallow it; with a troll there can be no better bait.

In landing a pike great caution is necessary, for his bite is esteemed venomous: the best and safest hold you can take of him is by the head, in doing which, place your thumb and finger in his eyes.

If you go any great distance from home, you will find it necessary to carry with you many more things than are here enumerated, most of which may be very well contained in a wicker pannier of about twelve inches wide, and eight high, and put into a hawking bag. The following is a list of the most material articles: a rod with a spare top, lines coiled up, and neatly laid round in flat boxes; spare links, single hairs, waxed thread, and silk; plummets of various sizes, floats of all kinds, and spare caps: worn bags and a gentle-box, hooks of all sizes, some whipped to single baits; shot, shoemaker's wax, in a very small gallipot covered with a bit of leather; a clearing ring, tied to about six yards of strong cord, the use of this is to disengage your hook when it has caught a weed, &c. in which case take off the butt of your rod and slip the ring over the remaining joints, and, holding it by the cord, let it gently fall; a landing net, the hoop whereof must be of iron, and made with joints to fold, and a socket to hold a staff. Take with you also such baits as you intend to use. And that you may keep your fish alive, be provided with a small hoop-net to draw close to the top, and never be without a sharp knife and a pair of scissors; and if you mean to use the artificial fly, have always your fly-hook with you.

And for the more convenient carriage of lines, links, single hairs, &c. take a piece of parchment or vellum, seven inches by ten; on the longer sides set off four inches, and then fold it cross-ways, so as to leave a slip of two inches, or thereabout; then take eight or ten pieces of parchment, of seven inches by four, put them into the parchment or vellum, so folded, and sew up the ends; then cut the flap rounding, and fold it down like a pocket-book, and bind the ends and round the flap with red tape.

And having several of these cases, you may fill them with lines, &c. proper for every kind of fishing; always remembering to put into each of them a gorgon, or small piece of cane, of five inches long, and a quarter of an inch wide, with a notch at each end; with this, when a fish has gorged your hook, you may, by putting it down his throat till you feel the hook (holding the line tight while you press it down), easily disengage it.

PIKED. *a.* (*pique*, French.) Sharp; acuminate; ending in a point (*Shakspeare*).

PIKEMAN. *s.* (*pike* and *man*.) A soldier armed with a pike (*Knolles*).

PIKESTAFF. *s.* (*pike* and *staff*.) The wooden pole of a pike (*Tatler*).

PILA, was a ball made in a different manner according to the different games in which it was to be used. Playing at ball was very common amongst the Romans of the first distinction, and was looked upon as a manly exercise, which contributed both to amusement and health. The pila was of four sorts: 1st, *follis* or balloon; 2d, *pila trigonalis*; 3d, *pila paganica*; 4th, *harpastum*. All these come under the general name of *pila*.

PILASTER, in architecture, a square column, sometimes insulated, but more frequent-

ly let within a wall, and only showing a fourth or fifth part of its thickness. See **ARCHITECTURE**.

PILATE (Pontius), a Roman governor of Judea. It was before him that our Saviour was brought, and condemned to death, though he asserted himself his innocence. Pilate was removed from Judæa by Tiberius for his cruelty, and sent an exile to Gaul, where he hanged himself, A. D. 37. The letter said to be written by him to Tiberius, giving an account of our Saviour and his miracles, is spurious.

PILATRE DU ROSIER (Francis), a native of Metz, who established a museum at Paris, and studied chemistry. On the discovery of balloons by Montgolfier, he first ventured to ascend the air in those frail vehicles. After various experiments, he formed the bold plan of passing over to England. He came to Boulogne, and on the 15th June, 1785, he, accompanied by his friend Romain, rose in a beautiful balloon before thousands of spectators, with the hopes of crossing the channel. Half an hour after, however, the machine caught fire, and the two unfortunate aeronauts were precipitated from a height of above 1500 feet to the ground, and dashed to pieces. They were buried in the village of Wimille, where a monument records their misfortune.

PILCHARD, in ichthyology. See **CLUPEA**.

PILCHER. *s.* (*pylece*, Saxon.) A furred gown or case; any thing lined with fur (*Hammer*).

PILE. *s.* (*pile*, Fr. *pyle*, Dutch.) 1. A strong piece of wood driven into the ground to make a firm foundation (*Knolles*). 2. A heap; an accumulation (*Shakspeare*). 3. Anything heaped together to be burned. 4. An edifice; a building (*Pope*). 5. (*pilus*, Latin.) A hair (*Shakspeare*). 6. Hairy surface; nap (*Grew*). 7. (*pilum*, Latin.) The head of an arrow.

To PILE. *v. a.* 1. To heap; to coacervate (*Shakspeare*). 2. To fill with something heaped (*Abbot*).

PILE, in botany, the cap of a fungus, expanding horizontally, and covering the fructifications.

PILE, in coinage, denotes a kind of punchon, which, in the old way of coining with the hammer, contained the arms, or other figure and inscription to be struck on the coin. Accordingly we still call the arms side of a piece of money the pile, and the head the cross, because in ancient coin a cross usually took the place of the head in ours: but some will have it called pile, from the impression of a church built on piles, struck on this side our ancient coins, and others will have it to come from *pile*, the old French word for a ship.

PILE, in heraldry, an ordinary in form of a wedge, contracting from the chief, and terminating in a point towards the bottom of the shield. The pile, like other ordinaries, is borne inverted, engrailed, &c. and issues indifferently from any point of the verge of an escutcheon.

PILE, in military affairs. Piles of shot or shells are generally formed in the king's magazines, in three different manners; the base

is either a triangular square, or a rectangle; and from thence the piles are called triangular, square, and oblong.

Rules for finding the Number of Shot in any Pile.

Triangular Pile. Multiply the number in the side of the base by the base $+ 1$, this product by the side $+ 2$, and divide by 6.

Square Pile. Multiply the bottom row by the bottom row $+ 1$, and this product by twice the bottom row $+ 2$, and divide by 6.

Rectangular Piles. Multiply the breadth of the base by itself $+ 1$, and this product by three times the difference between the length and breadth of the base, added to twice the breadth $+ 1$, and divide by 6.

Incomplete Piles. Incomplete piles being only frustrums, wanting a similar small pile on the top, compute first the whole pile as if complete, and also the small pile wanting at top; and then subtract the one number from the other.

PILE ENGINE, an engine constructed to facilitate the driving of piles, by means of the momentum of a heavy falling weight. The machines most used for this purpose are those invented by Bunce and Vauloué; for descriptions of which, see Gregory's *Mechanics*, vol. ii. and for scientific computations relative to the effects produced by pile-drivers, see Desaguliers's *Philosophy*, vol. i. *Philosophical Transactions*, new abt. vol. xiv. pa. 498; and Hutton's *Course of Mathematics*, vol. iii.

PILLEATED. *a.* (*pileus*, Lat.) Having the form of a cover or hat (*Woodward*).

PILER. *s.* (from *pile*.) He who accumulates.

PILES, in medicine. See **HEMORRHOIDS**.

PILES (Roger de), an ingenious painter, born at Clamecy, 1635. He visited several European courts, in the suite of the French ambassador, and in 1692 went to Holland as a secret negotiator, in the character of a picture virtuoso. His intrigues were discovered, and he was thrown into prison, from which the peace of Ryswick liberated him. In his confinement he wrote the lives of painters, and on his return to France received a pension. He died 1709, aged 74. He published besides a translation of Dufresnoy—an abridgement of anatomy accommodated to painting and sculpture—dissertations on the works of famous painters, &c.

PILEWORT, in botany. See **CHELEDONUM**.

To PILLFER. *v. a.* (*piller*, Fr.) To steal; to gain by petty robbery (*Bacon*).

To PILLFER. *v. n.* To practise petty theft (*Shakspeare*).

PILLFERER. *s.* (from *pilfer*.) One who steals petty things (*Atterbury*).

PILLFERINGLY. *ad.* With petty larceny; filchingly.

PILLFERY. *s.* (from *pilfer*.) Petty theft.

PILGRIM, one who travels through foreign countries to visit holy places, and to pay his devotion to the relics of dead saints. See

PILGRIMAGE. The word is formed from the Flemish *pelgrim*, or Italian *pelegrino*, which signifies the same; and those originally from the Latin *peregrinus*, a stranger or traveller.

To PILGRIM. *v. n.* (from the noun.) To wander; to ramble: not used (*Grew*).

PILGRIMAGE, a kind of religious discipline, which consists in taking a journey to some holy place in order to adore the relics of some deceased saint. Pilgrimages began to be made about the middle ages of the church; but they were most in vogue after the end of the 11th century, when every one was for visiting places of devotion, not excepting kings and princes themselves; and even bishops made no difficulty of being absent from their churches on the same account. The places most visited were Jerusalem, Rome, Compostella, and Tours; but the greatest numbers now or recently resort to Loretto, in order to visit the chamber of the blessed Virgin, in which she was born, and brought up her son Jesus till he was 12 years of age. This chamber, it is pretended, was carried by angels into Dalmatia, about the year 1291, and afterwards in the same manner transported to Loretto, where a magnificent cathedral is built over it. In this chamber is the image of the blessed Virgin, almost covered with pearls and diamonds, and round the statue there is a kind of rainbow, formed of precious stones of various colours. Five hundred thousand pilgrims have sometimes resorted to this house in one year, in order to pay their devotions before this glorious image.

Several of the principal orders of knighthood were established in favour of pilgrims going to the Holy Land, to secure them from the violence and insults of the Saracens and Arabs, &c.

Such were the orders of the knights Templars, the knights Hospitalers, knights of Malta, &c.

The Mahometans are commanded in the Koran to perform a pilgrimage to Mecca; this is one of the capital points of their religion, and therefore a prodigious cavalcade of pilgrims annually go thither, in the company of those who are sent with the grand seignor's presents to the tomb of Mahomet.

Dr. Johnson, in his *Rasselas*, gives us some observations on pilgrimage, which are so much to the purpose, that we think we cannot do better than lay them before our readers. "Pilgrimage (said Imlac, into whose mouth the observations are put), like many other acts of piety, may be reasonable or superstitious according to the principles upon which it is performed. Long journeys in search of truth are not commanded. Truth, such as is necessary to the regulation of life, is always found where it is honestly sought: change of place is no natural cause of the increase of piety, for it inevitably produces dissipation of mind. Yet since men go every day to view the fields where great actions have been performed, and return with stronger impressions of the event, curiosity of the same kind may naturally dispose us to view that country whence our religion had its be-

ginning: and I believe no man surveys those awful scenes without some confirmation of holy resolutions. That the Supreme Being may be more easily propitiated in one place than in another, is the dream of idle superstition; but that some places may operate upon our own minds in an uncommon manner, is an opinion which hourly experience will justify. He who supposes that his vices may be more successfully combated in Palestine, will, perhaps, find himself mistaken; yet he may go thither without folly: he who thinks they will be more freely pardoned, dishonours at once his reason and religion."

PILI CONGENITI. The hairs of the head, eyebrows, and eyelids, are so termed, because they grow in *utero*.

PILI POSTGENITI. The hair which grows from the surface of the body after birth is so termed, in contradiction to that which appears before birth; as the hair of the head, eyebrows, and eyelids.

PILL. In pharmacy, a particular mode of compounding certain preparations; for which see **PILULÆ**.

To PILL. v. a. (*piller*, French.) 1. To rob; to plunder (*Shakspeare*). 2. For peel: to strip off the bark (*Genesis*).

To PILL. v. n. To be stript away; to come off in flakes or scoriae: properly *peel* (*Tobit*).

PILLAGE. s. (*pillage*, French.) 1. Plunder; something got by pilling (*Shakspeare*). 2. The act of plundering (*Shakspeare*).

To PILLAGE. v. a. (from the noun.) To plunder; to spoil (*Arbutnot*).

PILLAGER. s. (from *pillage*.) A plunderer; a spoiler (*Chapman*).

PILLAR. s. (*pilier*, Fr. *pilar*, Spanish.) 1. A column (*Wotton*). 2. A supporter; a maintainer (*Shakspeare*).

PILLAR, in the manage. Most of the great riding-schools have pillars fixed in the middle of the manage ground, to point out the center; but all manages in general have, upon the side or circumference, other pillars placed, two and two, at certain distances, whence these are called the two pillars, to distinguish them from that of the center.

When they speak of the former, they call it working round the pillar; and when they refer to the other two, they call it working between the two pillars. The pillar of the center serves to regulate and adjust the extent of ground, to the end that the manage upon volts may be performed with method and justness, and that they may work in a square by rule and measure, upon four lines of the volt, which ought to be imagined at an equal distance from the center. It serves likewise to break unruly high-mettled horses, without endangering the rider, the horse being tied to a long rope, one end of which is made fast to a pillar, and managed by a man placed by the pillar, which keeps the horse in subjection, and hinders him from flying out.

PILLARED. a. (from *pillar*.) 1. Supported by columns (*Milton*). 2. Having the form of a column (*Thomson*).

PILLION. s. (from *pillow*.) 1. A soft saddle set behind a horseman for a woman to sit on (*Swift*). 2. A pad; a pannel; a low saddle (*Spenser*). 3. The pad of the saddle that touches the horse.

PILLORY (*collistrigium, collum stringens; pilloria*, from the French *pilleur*, i. e. *depeculator*, or *pelori*; derived from the Greek *πύλη, janua*, a door, because one standing on the pillory puts his head as it were through a door, and *ὀραω, video*), is an engine made of wood to punish offenders, by exposing them to public view, and rendering them infamous. There is a statute of the pillory, 51 Hen. III. And by statute it is appointed for bakers, forestallers, and those who use false weights, perjury, forgery, &c. 3 Inst. 219. Lords of leets are to have a pillory and tumbrel, or it will be the cause of forfeiture of the leet; and a village may be bound by prescription to provide a pillory, &c. 2 Hawk. P. C. 73.

To P'LLORY. v. a. (*pillorier*, French.) To punish with the pillory (*Government of the Tongue*).

P'LLOW. s. (*pylle*, Sax.; *pulewe*, Dutch.) A bag of down or feathers laid under the head to sleep on (*Donne*).

To P'LLOW. v. a. To rest any thing on a pillow (*Milton*).

P'LLOWBEER. P'LLOWCASE. s. The cover of a pillow (*Swift*).

PILOBOLUS, in botany, a genus of the class cryptogamia, order fungi. Fungus on a capillary stem, inflated, and watry at top, with an hæmispheerical head elastically ejecting the seeds. Three species; mushrooms of our own country.

PILOCARPUS, in botany, a genus of the class pentandria, order monogynia. Calyx five-leaved; corol five-petalled; stamens inserted under the germ; capsules five, united at the base, one-seeded, elastic; seeds axillate. One species; a Montserrat shrub, with pendulous branches, and solitary racemes from their tops.

PILOSELLA. (from *pilus*, hair, because its leaves are hairy.) *Auricula muris*. *Myosotis*. Mouse ear. This common plant, *Hieracium pilocella* of Linnæus, contains a bitter lactescent juice, which has a slight degree of adstringency. The roots are more powerful than the leaves. They are very seldom used in this country.

PILOSITY. s. (from *pilosus*, Lat.) Hairiness (*Bacon*).

PILOT, a person employed to conduct ships over bars and sands, or through intricate channels, into a road or harbour. Pilots are no constant and standing officers aboard our vessels, but are called in occasionally, on coasts or shores unknown to the master, and having piloted in the vessel, they return to the shore where they reside.

Every respect and attention are paid to pilots on board his Majesty's ships: they are likewise well accommodated, and when conducting a ship have the sole command of it, and may give orders for steering, setting, trimming,

&c. The captain is to see that all the officers and men obey his orders.

Pilots taking upon them to conduct ships up the Thames are to be examined and approved by the master and wardens of the Trinity-house at Deptford, or shall be liable to forfeit 10*l.* for the first offence, and 20*l.* for the second, &c. and the like penalty, if they act without licence from the said master and wardens; and if by their negligence they lose a ship, they shall be for ever disabled. 3 Geo. I. and 5 Geo. II. c. 20. 30.

To *PILOT. v. a.* (from the noun.) To steer; to direct in the course.

PILOT FISH, in ichthyology. See *GASTROSTEUS*.

PILOTAGE. s. (*pilotage*, Fr. from *pilot*.) 1. Pilot's skill; knowledge of coasts (*Ral.*). 2. A pilot's hire (*Ainsworth*).

PILOUS LEAF, in botany. A hairy leaf. Having the surface covered with long distinct hairs: as in *cortusa*, *juncus pilosus sylvaticus*, *campestris*.—*Pilosus seed*. A hairy seed. As in *centaurea* and *tragopogon*.—*Pilosus receptacle*. A hairy receptacle. Having hairs between the florets.

PILPAY, an ancient Bramin fabulist, whose fables, written above 2000 years ago, were translated into French from the Greek or Persian, by Galland, 1755. It is supposed that he was governor of Indostan, and counsellor to an Indian king.

PILULÆ, in pharmacy, pills: small balls or masses of pharmaceutic materials, or the general mass itself from which the balls are formed. The different preparations in different pharmacopœias existing under this name are very numerous. The following are some of the chief.

PILULÆ ALOES COMPOSITÆ. From fifteen to twenty-five grains prove moderately purgative and stomachic.

PILULÆ ALOES CUM MYRRHA. From ten grains to a scruple of this pill, substituted for the *pilula rufi*, prove stomachic and laxative, and are calculated for delicate females, especially where there is uterine obstruction.

P. CUPRI. An excellent tonic and diaphoretic pill, which may be given with advantage in dropsical diseases, where tonics and diuretics are indicated.

P. GALBANI COMPOSITÆ. A stimulating antispasmodic and emmenagogue. From a scruple to half a drachm may be given three times a day in nervous disorders of the stomach and intestines, in hysterical affections and hypochondriasis.

P. HYDRARGYRI. An alterative and anti-venereal pill, which mostly acts on the bowels if given in sufficient quantity to attempt the removal of the venereal disease, and therefore requires the addition of opium. Joined with the squill pill, it forms an excellent expectorant and alterative, calculated to assist the removal of dropsical diseases of the chest, and asthmas attended with visceral obstruction.

P. HYDRARGYRI SUBMURIATIS, SIVE, CALOMELANOS COMPOSITÆ. This is intended as a substitute for the famed Plummer's pill. It is exhibited as an alterative in a variety of diseases, especially cutaneous eruptions, pains of the venereal or rheumatic kind, cancerous and scirrhus affections, and chronic ophthalmia.

P. SAPONIS CUM OPIO. Five grains of this mass contain one of opium.

P. RHEI COMPOSITÆ. Laxative and stomachic, in the dose of from fifteen grains to half a drachm.

P. SCILLÆ. An attenuant, expectorant, and diuretic pill, mostly administered in the cure of asthma and dropsy.

PILULARIA. Pill-wort. In botany, a genus of the class cryptogamia, order musci. Common receptacle globular, villous, four-celled, four-valved, filled with numerous anthers and many globular germs beneath them. One species only, *P. globulifera*, common to our own pastures.

PILUM, a missive weapon used by the Roman soldiers, and in a charge darted upon the enemy. Its point, we are told by Polybius, was so long and small, that after the first discharge it was generally so bent as to be rendered useless. The legionary soldiers made use of the pilum, and each man carried two.

PILUMNUS. See *PICUMNUS*.

PILUS. (*πῖλος*; wool carded.) In anatomy, the short hair which is found all over the body. See *CAPILLUS*.

PILUS, in botany. *Ductus excretorius plantæ setaceous*. An excretory duct of a plant, in shape of a bristle.—This, however, appears to be an improper explanation of hair by bristle, inasmuch as a bristle is only a stiff hair.—It is a sort of pubescence.

PIMELIA, in botany, a genus of the class diandria, order monogynia. Calyxless; corol four-cleft, stamens inserted into the throat; nut covered with a bark, one-celled. Four species: all natives of Australasia or New Zealand.

PIMELIA, in zoology, a genus of the class insecta, order coleoptera. Antennas filiform; feelers four; thorax plano-convex, margined; head exserted; shells rather rigid; wings usually none. A hundred and seventeen species, scattered over the globe, five or six common to our own country: found in dry deserts, and gardens, and sometimes in houses; several species in filth and manure. The genus is thus subdivided.

A. Antennas moniliform at the tip.

a. Feelers filiform; comprising the *pimela* tribe of Fabricius.

6. Feelers clavate; the blaps of Fabricius.

B. Antennas entirely filiform.

a. Feelers four, filiform. The *sepidium* of Fabricius.

6. Fore-feelers hatchet-shaped, hind-ones clavate. The *helops* of Fabricius.

The following may serve as specimens:

1. *P. sulcata*. Shells mucronate, grooved;

the grooves eight or nine, and the shells united. Inhabits the East; and is sold in Turkey as a specific against pains in the ears, and the bite of scorpions. It is also boiled with butter and eaten by the Turkish ladies for the purpose of making them grow fat.

2. *P. mortisaga*. Black; shells mucronate, subpunctured. Inhabits Europe, and found in our own country. This inoffensive animal is regarded as a presage of the death of some one in a family, by the common people of Sweden, if seen crawling about the house.

PIMENTA. See PIMENTO.

PIMENTO. (from *Pamienta*, Sp. pepper.) Jamaica pepper, or allspice. *Amomum pimenta*. *Myrtus pimenta* of Linnéus. *Myrtus floribus trichotomo-paniculatis, foliis oblongo-lanceolatis*, Hort. Kew. C. O. Icosandria, monogynia. This spice, which was first brought over for dietetic uses, has been long employed in the shops as a succedaneum to the more costly oriental aromatics: it is moderately warm, of an agreeable flavour, somewhat resembling that of a mixture of cloves, cinnamon, and nutmegs. Both pharmacopœias direct an aqueous and spirituous distillation to be made from these berries; and the Edinburgh College orders also the *oleum essentielle piperis Jamaicaensis*.

PIMP. *s.* (*pinge*, Fr. *Skinner*.) One who provides gratifications for the lust of others; a procurer; a pander (*Addison*).

To PIMP. *v. a.* (from the noun.) To provide gratifications for the lust of others; to pander; to procure (*Swift*).

PIMPERNEL, in botany. See ANAGALLIS.

PIMPINELLA. Barnet-saxifrage. In botany, a genus of the class pentandria, order digynia. Fruit ovate-oblong, striate; petals inflexed; stigmas subglobular. Nine species, south of Europe, Egypt, the Cape; three common to the mountains, dry soils, or hedges of our own country. The two following are chiefly worth noticing.

1. *P. magna*. Greater saxifrage. Leaves pinnate, all the leaflets ovate, the terminal one three-lobed. Two other varieties of it; all found in our hedges.

2. *P. anisum*. Anise. Leaves trifid and cut; an annual, originally of Egypt; but now largely grown in Spain and Malta, from both which places the market of this country is supplied. The seeds of both these, but especially of the latter, are employed as carminatives in medicine: for the pharmacœutic properties, see ANISUM.

PIMPINELLA ITALICA. The root which bears this name in some pharmacopœias is that of the *sanguisorba officinalis* of Linnéus. It is now fallen into disuse.

PIMPING. *a.* (*pimple mensch*, a weak man, Dutch.) Little; petty (*Skinner*).

PIMPLA, a mountain of Macedonia, on the confines of Thessaly, near Olympus, sacred to the Muses, who on that account are often called *Pimpleæ* and *Pimpleades*.

PIMPLE. *s.* (*pompette*, Fr.) A small red pustule (*Addison*).

PIMPLED. *a.* (from *pimple*.) Having red pustules; full of pimples.

PIN. *s.* (*espingle*, French.) 1. A short wire with a sharp point and round head, used by women to fasten their clothes (*Pope*). 2. Any thing inconsiderable or of little value (*Spenser*). 3. Any thing driven to hold parts together; a peg; a bolt (*Milton*). 4. A slender thing fixed in another body. 5. That which locks the wheel to the axle. 6. The central part (*Sh.*). 7. The pegs by which musicians intend or relax their strings. 8. A note; a strain (*L'Es-trange*). 9. A horny induration of the membranes of the eye (*Shakspeare*). 10. A cylindrical roller made of wood, with which pastry is wrought (*Corbet*). 11. A noxious humour in a hawk's foot.

To PIN. *v. a.* (from the noun.) 1. To fasten with pins (*Pope*). 2. To fasten; to make fast (*Shakspeare*). 3. To join; to fix; to fasten (*Digby*). 4. (pinban, Sax.) To shut up; to enclose; to confine, as in pinfold (*Hooker*).

PIN, according to the first of the above acceptations, though an apparently insignificant instrument, is an important article in commerce. The art of making pins of brass wire was not known in England before the year 1543: prior to that period they were made of ivory, bone, or box. In the year 1543, by statute 34 and 35 of Henry VIII. cap. vi. it was enacted, "that no person shall put to sale any pinnes but only such as shall be double-headed, and have the heads soldered fast to the shank of the pins, well smoothed, the shank well shapen, the points well and round filed, cauted, and sharpened." From the above extract it should appear that the art of pin-making was but of late invention, probably introduced from France; and that our manufactories since that period have wonderfully improved.

The pin manufactory was introduced into Gloucester in 1626 by John Tilsby: there are now in Gloucester nine distinct pin manufactories, which employ together at least 1500 persons.

Though pins are of apparently simple construction, their manufacture, however, is not a little curious and complex. We have traced with much pleasure the whole process in the manufactories at Gloucester, and observed that the article, small as it is, passes through 25 hands from its first state of rough wire to its being stuck in paper for sale. The following may suffice for a general sketch of the method.

When the brass wire, of which the pins are formed, is first received at the manufactory, it is generally too thick for the purpose of being cut into pins. The first operation therefore is that of winding it off from one wheel to another with great velocity, and causing it to pass between the two, through a circle in a piece of iron of smaller diameter: the wire being thus reduced to its proper dimensions, is straight-

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ened by drawing it between iron pins, fixed in a board in a zigzag manner, but so as to leave a straight line between them: afterwards it is cut into lengths of three or four yards, and then into smaller ones, every length being sufficient to make six pins; each end of these is ground to a point, which is commonly performed by boys, who sit each with two small grinding-stones before him, turned by a wheel. Taking up a handful, he applies the ends to the coarsest of the two stones, being careful at the same time to keep each piece moving round between his fingers, so that the points may not become flat: he then gives them a smoother and sharper point, by applying them to the other stone, and by that means a lad of twelve or fourteen years of age is enabled to point about 16,000 pins in an hour. When the wire is thus pointed, a pin is taken off from each end, and this is repeated till it is cut into six pieces. The next operation is that of forming the heads, or, as they term it, head-spinning; which is done by means of a spinning-wheel, one piece of wire being thus with astonishing rapidity wound round another, and the interior one being drawn out leaves a hollow tube between the circumvolutions: it is then cut with shears, every two circumvolutions or turns of the wire forming one head: these are softened by throwing them into iron pans, and placing them in a furnace till they are red-hot. As soon as they are cold, they are distributed to children, who sit with anvils and hammers before them, which they work with their feet, by means of a lathe; and taking up one of the lengths, they thrust the blunt end into a quantity of the heads which lie before them; and catching one at the extremity, they apply them immediately to the anvil and hammer; and by a motion or two of the foot, the point and the head are fixed together in much less time than it can be described, and with a dexterity only to be acquired by practice; the spectator being in continual apprehension for the safety of their fingers' ends. The pin is now finished as to its form, but still it is merely brass; it is therefore thrown into a copper, containing a solution of tin and the leys of wine. Here it remains for some time; and when taken out assumes a white, though dull, appearance: in order therefore to give a polish, it is put into a tub containing a quantity of bran, which is set in motion by turning a shaft that runs through its centre; and thus by means of friction it becomes perfectly bright. The pin being complete, nothing remains but to separate from the bran; which is performed by a mode exactly similar to the winnowing of corn, the bran flying off, and leaving the pin behind fit for immediate sale. There is in many respects a considerable resemblance between the manufactory of pins and that of needles. See **NEEDLE**.

PINASTELLUM. (*pinastellum*, from *pinus*, the pine-tree; so called because its leaves resemble those of the pine-tree.) Hog's fennel. See **PEUCEDANUM**.

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PINASTER, in botany. See **PINUS**.

PIN PILLOW, in botany. See **CACTUS**.

PINCASE. *s.* (*pin and case*.) A pincushion, or small box for pins.

PINCERS. *s.* (*pincette*, French.) 1. An instrument by which nails are drawn, or any thing is griped, which requires to be held hard (*Spenser*). 2. The claw of an animal (*Addison*).

To PINCH. *v. a.* (*pincer*, French.) 1. To squeeze between the fingers, or with the teeth (*Shakspeare*). 2. To hold hard with an instrument. 3. To squeeze the flesh till it is pained or livid (*Shakspeare*). 4. To press between hard bodies. 5. To gall; to fret (*Shakspeare*). 6. To gripe; to oppress; to straiten (*Raleigh*). 7. To distress; to pain (*Thomson*). 8. To press; to drive to difficulties (*Watts*). 9. To try thoroughly; to force out what is contained within (*Collier*).

To PINCH. *v. n.* 1. To act with force, so as to be felt; to bear hard upon; to be puzzling (*Dryden*). 2. To spare; to be frugal (*Dryd.*).

PINCH. *s.* (*pinçon*, Fr. from the verb.) 1. A painful squeeze with the fingers (*Dryden*). 2. A gripe; a pain given (*Shakspeare*). 3. Oppression; distress inflicted (*L'Estrange*). 4. Difficulty; time of distress (*L'Estrange*).

PINCHFAST. **PINCHPENNY.** *s.* (*pinch, fist, and penny*.) A miser (*Ainsworth*).

PINCHBECK, a compound metal. See **ZINCUM**.

PINCUSHION. *s.* (*pin and cushion*.) A small bag stuffed with bran or wool on which pins are stuck (*Addison*).

PINDAR, a celebrated lyric poet, of Thebes. He was trained from his earliest years to the study of music and poetry, and was taught how to compose verses with elegance by Myrtis and Corinna. When young, it is said that a swarm of bees settled on his lips, and there left some honey-combs as he reposed on the grass. This was explained as a prognostic of his future celebrity. In the public assemblies of Greece, where females were not permitted to contend, Pindar was rewarded with the prize, in preference to every other competitor. His hymns and pæans, composed on the conquerors at Olympia, &c. were repeated before the most crowded assemblies in the temples of Greece. It is said that Pindar died suddenly at the public gymnasium, at the advanced age of 86, B. C. 435, and that he was honoured with every mark of respect even to adoration. When the Lacedæmonians took Thebes, they spared the house of Pindar; and Alexander the Great did the same thing.

The fragments of Pindar collected from the ancients are arranged under the following heads, according to their subject, style of composition, and the musical modes to which they were adapted; *Scolia*, *Parthenia*, the distinguishing characters of which are obscure; *Threni*, in which the genius of Pindar was regarded by the ancients as inferior to that of Simonides; *Hyporchemata*, poems accompanied by dances, and chiefly devoted to the honour of Apollo;

Prosodia, Hymns, Pæans Dithyrambi. A considerable and remarkable fragment of a poem on an eclipse of the sun is preserved by Dionysius of Halicarnassus, in which the poet prays that the baneful influence of this prodigy may be averted from Thebes, whatever be the calamity which it forebodes, whether war, destruction to the produce of the earth, violent storms of snow, sedition, inroads of the sea, frost, a summer of incessant rain, or a deluge which should again sweep away the inhabitants of the earth.

The only remaining works of Pindar are forty-five odes, written in praise of the victors at the Olympic, Pythian, Nemean, and Isthmian games. The subjects, it must be allowed, are as unpromising as those of a modern laureat. Accordingly Pindar commonly treats his hero with very little ceremony, and bestowing on him a few lines of praise, and sometimes of advice, at the beginning and end of his ode, he usually employs the intermediate space in relating some fable of mythology, which may possess a relation more or less direct to the subject of his celebration. Thus in the longest of his remaining works, the fourth Pythian ode, addressed to Arcesilaus, prince of Cyrene, who had gained the victory in a chariot race at the Pythian games, in the second sentence he digresses to the colonization of Cyrene from Thera, and thence to the Argonautic expedition, in which that event was predicted, and the pledge of its accomplishment received. This furnishes Pindar with what he deems the proper subject of an ode, and he relates at length in a lyric style the chief events of the Argonautic expedition. He concludes with some sentences of advice, couched in elegant language, adapted to the circumstances of Arcesilaus and Cyrene; and intercedes in a delicate and respectful manner in favour of Damophilus, a Cyrenean exile, whom the poet had lately met at Thebes. The odes of Pindar are written in the boldest style of lyric poetry. It follows, therefore, that they abound in rapid and sudden transitions, and daring metaphors. In almost every ode his digressions are as free as in the single instance which has been cited. A few specimens will shew the license of his metaphors. *Ætna* is described as "the nurse of snow through the entire year." Tacitus, indeed, in prose employs an expression scarcely less bold, when he speaks of a mountain as "faithful to the snows." In the same ode from which the former expression is taken, he advises Hiero to "rule his people with a just helm, and to forge his tongue on the anvil of truth." This poet is universally admired, for his energy and magnificence of style, harmony of numbers, and elegance of diction.

Pindar was first printed by Aldus, with Calimachus, *Dionysius des itu orbis*, and *Lycophron*. Venet. 1513, 8vo.

The edition of Calliægues (Roma, 1515, 4to.) is more valued than the preceding. It contains the scholia, and is the chief basis of subsequent editions.

Cratander's edition, Basil, 1526, 8vo. taken from the former, is regarded as correct and valuable.

A splendid edition was published at Paris by Morel, 1558, 4to.

Several small editions were published by Henry and Paul Stephens, with the fragments of other lyric poets.

Erasmus Schmidt published Pindar, Witteberg, 1616, 4to. Schmidt was a man of real learning, and has perhaps done more for the illustration of Pindar than any other individual, though his learning partakes of the diffuseness, and his illustrations of the rhetorical formality, of his age.

An edition was published (Salmurii, 1620, 4to.) by J. Benedictus, a well-known scholar, and Greek professor at Saumur. It contains much useful illustration of the difficulties of the poet.

The Oxford edition of 1697, fol. by West and Welsted, is splendid and scarce. They have chiefly followed Schmidt. The edition is respectable, but the good intentions of the editors are valued rather more highly than their learning or sagacity.

Heyne's two editions of Pindar (Gott. 1773, 4to. 2 vols.; 1798, 8vo. 3 vols.) are very valuable. The latter is much the more ample.

Nearly a fourth of Pindar's odes were translated into English by Mr. West: the translation has been recently completed by an unknown hand, and the whole published in 4to. by Mr. Lee, in 1810. There is also a very respectable translation, by the rev. Mr. Girdlestone of Beccles.

PINDARIC ODE, an ode formed in imitation of Pindar.

PINDUS, a mountain, or rather a chain of mountains, between Thessaly, Macedonia, and Epirus. It was greatly celebrated as being sacred to the Muses and to Apollo.

PINDUST. *s. (pin and dust.)* Particles of metal made by pointing pins (*Digby*).

PINE, or **PINE-TREE**. See **PINUS**.

PINE-SCREW. See **PANDANUS**.

PINE-APPLE. See **BROMELIA**.

PINE-THISTLE. See **CARLINA GUMMIFERA**.

To PINE. v. n. (pinjan, Sax. pijnen, Dut.)
1. To languish; to wear away with any kind of misery (*Spenser*). 2. To languish with desire (*Shakspeare*).

To PINE. v. a. 1. To wear out; to make to languish (Shakspeare). 2. To grieve for; to bemoan in silence (Milton).

PINEA. (*pineæ*.) The stone pine. The young and fresh fruit of this plant, *pinus pinea* of Linnæus, are eaten in some countries in the same manner as almonds here, either alone or mixed with sugar. They are nutritive, demulcent, and laxative.

PINEAL GLAND. (called *pineal* from *pineæ*, a pine-apple, from its supposed resemblance to that fruit). *Glandula pinealis*. *Cornarium*. In anatomy, a small heart-like substance, about the size of a pea, situated imme-

diately over the corpora quadrigemina, and hanging from the thalami nervorum opticorum by two crura or peduncles. Its use is not known. It was formerly supposed to be the seat of the soul.

PINEAU (Gabriel du), of Angers, was called to the bar, and became so respectable, that he was confidently consulted in all affairs of moment, and was made master of requests by Mary de Medicis, and by her son Lewis XIII. mayor and captain general of the town of Angers. He acquired the appellation of father of the people. He died 1644, aged 71. He was author of Latin notes on the canon law in opposition to Du Moulin—commentaries, observations, &c. on custom and law, with dissertations, &c. 2 vols. fol.

PINEDA (John), a jesuit, of Seville, skilled in oriental literature. He died 1637. He wrote commentaries on Job, 2 vols. fol.—and also on Ecclesiastes—a learned work de rebus Solomonis, fol.—an universal history of the church, in Spanish, 4 vols. fol. &c.

PINELLI (John Vincent), born at Naples in 1553, was celebrated for the vast library he formed. His capacious mind embraced antiquity, natural history, medals, and every other science. He died in 1601. His library was greatly enlarged by his descendants, and was purchased by Mr. Robson, a London bookseller, by whom they were sold by auction in 1790.

PINES (Isle of), an island in the S. Pacific ocean, off the S. end of New Caledonia, 14 miles in length. It is quite a pointed hill, sloping toward the extremities, which are very low; and on the low land are many tall pine trees. Lon. 167. 38 E. Lat. 22. 38 S.

PINEUS PURGANS. See **RICINUS MAJOR.**

PINFEATHERED. *a.* (*pin* and *feather.*) Not fledged; having the feathers yet only beginning to shoot (*Dryden*).

PINFOLD. *s.* (*pin* and *fold*.) A place in which beasts are confined.

PINGLE. *s.* A small close; an enclosure.

PINGRE (Alexander Guy), a celebrated French scholar, born in 1709. He was a strenuous supporter of the liberties of the Gallican church against the bishops; so that in the space of four years, he received five lettres de cachet. He next applied himself to astronomy, and published A calculation of an eclipse of the moon on the 23d of December, 1749. The academy of sciences, in 1760, appointed him to observe the transit of Venus. Pingré calculated the eclipses of a thousand years before the vulgar æra. He was elected geographical astronomer in the room of De Lisle; and translated that difficult work, Manilius's poetical treatise on astronomy.

In the year 1784 he published *Cometographie*, in 2 vols. 4to. containing a history of all the methods employed to determine the elements of comets, and an extensive table of those elements. The latter part of his life he

dedicated to botany with considerable success. He died in 1796. Interesting memoirs of this ingenious philosopher are given in the *Monthly Magazine*, vol. ii. pa. 671.

PING-LIANG, a city of China, of the first rank, in the province of Chen-si; seated on the river Kin-ho, 550 miles S.W. of Peking. Lon. 106. 25 E. Lat. 35. 35 N.

PINGUEDO. (from *pinguis*, fat.) Fat. See **FAT.**

PINGUICULA. Butterwort. Yorkshire sanicle. In botany, a genus of the class dianthia, order monogynia: corol ringent, spurred; calyx two-lipped, five-cleft; capsule one-celled. Five species: two common to the bogs of our own country, the rest to the continent of Europe. Those of our own country have pale red, purple, or deep violet flowers, hairy within. The Swedes and Laplanders, among whom also both these species grow wild, employ the leaves to give consistency to their milk, which being passed through them in a strainer acquires the thickness of butter, the serum being at the same time prevented from separation. Cows, sheep, goats, horses, and swine, equally refuse the leaves; and there is a vulgar but erroneous opinion that when eaten accidentally by sheep they produce the disease called the rot. The remarkable unctuousity of this plant has caused it to be applied to chaps, and as a pomatum to the hair. Decoctions of the leaves in broths are used by the common people in Wales as a cathartic.

PINGUID. *a.* (*pinguis*, Lat.) Fat; unctuous (*Mortimer*).

PINGUIN, in botany. See **BROMELIA.**
PINGUIN PINGUIN. In ornithology. See **APTENODYTES.**

PINHEL, a strong town of Portugal, in Beira, capital of a territory of the same name. It is seated on the Coa, 28 miles N. by W. of Guarda. Lon. 6. 40 W. Lat. 40. 46 N.

PINHOLE. *s.* (*pin* and *hole.*) A small hole, such as is made by the perforation of a pin (*Wiseman*).

PINHONES INDICI. In botany. See **RICINUS MAJOR.**

PINION. *s.* (*pignon*, French.) 1. The joint of the wing remotest from the body. 2. A feather or quill of the wing (*Shakspeare*). 3. Wing (*Swift*). 4. The tooth of a smaller wheel, answering to that of a larger. 5. Fetters for the arms (*Ainsworth*).

To PINION. v. a. (from the noun.) 1. To bind the wings (*Bacon*). 2. To confine by binding the wings. 3. To bind the arm to the body (*Dryden*). 4. To confine by binding the elbows to the sides (*Dryden*). 5. To shackle; to bind (*Herbert*). 6. To bind to: not proper (*Pope*).

PINK, a name given to a ship with a very narrow stern; whence all vessels, however small, whose sterns are fashioned in this manner, are called pink sterned.

PINK, in botany. See **DIANTHUS.**

PINK (Indian), in botany. See **DIANTHUS.**

P I N

PINK (Mule), in botany. See **DIANTHUS**.

PINK (Sea), in botany. See **STATICE**.

PINK (Dutch), is a pigment formed of chalk, coloured with the tinging particles of French berries, or other vegetables. It is principally used for coarser purposes in water. It may be made by boiling one pound of French berries and four ounces of powdered turmeric root in a gallon of water for two hours, and then straining off the tincture through flannel, and boiling it again with an ounce of alum, till it be evaporated to one quart. Prepare in the mean time four pounds of chalk, by washing it over, and afterwards drying it; and mix the chalk with the tincture, by grinding them together, and then dry it on boards. It is sometimes prepared in the same manner with starch and white lead. Its goodness consists in its being of a full gold-coloured yellow, and very bright.

PINK (English), is only a lighter and coarser kind of Dutch pink; and may be prepared in the same manner, the quantity of chalk being increased in proportion, as it is intended to be inferior to the Dutch.

There are also other kinds of pink, as brown pink, rose pink, &c. which need not be described here.

To **PINK**. *v. n.* (from *pink*, Dutch, an eye.) To work in eyelet holes; to pierce in small holes (*Prior*).

To **PINK**. *v. n.* (*pinken*, Dutch.) To wink with the eyes (*L'Estrange*).

PINMAKER. *s.* (*pin* and *make*.) He who makes pins.

PINMONEY. *s.* (*pin* and *money*.) Money allowed to a wife for her private expences without account (*Addison*).

PINNA. Nacre. In zoology, a genus of the class vermes, order testacea. Animal a limax; shell bivalve, fragile, upright, gaping at one end, and furnished with a byssus or beard; hinge without teeth, the valves united into one. The inhabitants of these shells produce a large quantity of fine strong byssus, which by the Italians is woven into a sort of silk; the shells are generally found standing erect in the smoother waters of bays, with the larger end a little open; the animals or fishes of many are accounted a rich food. Eighteen species, scattered through the seas of the globe, of which only one is found on our own coast, *P. muricata*, a striate shell with concave, ovate, acute scales: from three to nine inches long, and from one to three broad; thin, brittle, pellucid, horny; the outside with longitudinal ribs, rough, with rows of small prickles. See *Nat. Hist. Pl. CLXIV*.

PINNA. The large feather of a bird's wing; or a fin in fishes: applied in botany to the leaflet of some compound leaves.

A subdivision of the pinna is called *pinnula*, or *pinnule*.

PINNACE. *s.* (*pinnasse*, Fr. *pinnacia*, Ital.) A boat belonging to a ship of war. It seems formerly to have signified rather a small sloop or bark attending a larger ship (*Raleigh*).

P I N

PINNACLE. *s.* (*pinnacle*, Fr. *pinna*, Lat.) 1. A turret or elevation above the rest of the building (*Clarendon*). 2. A high spiring point (*Cowley*).

PINNATE LEAF. Cum petiolus simplex lateribus adnectit foliola plura. A species of compound leaf, wherein a simple petiole has several leaflets fastened to each side of it.

Conjugate. Having only one pair of leaflets.

Bijugate, having two; trijugate, having three; quadrijugate, having four pairs of leaflets.

Pinnate unequally. Terminated by a single or odd leaflet.

P. abruptly. Not terminated either by a leaflet or tendril.

P. cirrhosely. Terminated by a tendril.

P. oppositely. Having the leaflets placed over against each other in pairs.

P. alternately. Having the leaflets alternate along the common petiole.

P. interruptedly. Having smaller leaflets interposed between the principal ones.

P. articulately. When the common petiole is jointed.

P. decursively. When the leaflets run into one another along the common petiole.

PINNATIFID LEAF. By the Lichfield society called featherclef. Transversim divium lacinis horizontalibus oblongis. A species of simple leaf, divided transversely by oblong horizontal segments or jags; not extending to the midrib.

PINNEBERG, a town of Lower Saxony, in the duchy of Holstein, capital of a lordship, with a castle. It is seated on the Owe, 15 miles N.W. of Hamburg, and 16 S.E. of Gluckstadt.

PINNER. *s.* (from *pinna*, or *pinion*.) 1. The lappet of a head which flies loose (*Addison*). 2. A pinmaker (*Ainsworth*).

PINNULATE LEAF, or **PINNA**. When each pinna is subdivided.

PINOS, an island of the W. Indies, on the S. side of Cuba, 25 miles long and 15 broad, mountainous, and covered with pines. Lon. 82. 33 W. Lat. 22. 2 N.

PINSK, a town of Lithuania, in the palatinate of Brzesc. There are many Jews among the inhabitants, and the Greeks have a bishop. The chief manufacture is dressing Russian leather. It is surrounded by morasses, and stands on a river of the same name, 95 miles E. of Brzesc. Lon. 26. 20 E. Lat. 52. 18 N.

PINT, (*pinta*), a vessel, or measure, used in estimating the quantity of liquids, and even sometimes of dry things. Budæus derives the word from the Greek *πνιτα*; others from the German *pint*, a little measure of wine; Nicod from the Greek *πνιτα*, to drink. The English pint is twofold; the one for wine-measure, the other for beer and ale-measure, the former being equivalent to 28 $\frac{1}{2}$ cubic inches, the latter to 35 $\frac{1}{2}$ inches. The pint among druggists and medical men is 12 ounces.

PINTADO, in ornithology. See **NUMIDIA**.

PINTLES, certain pints or hooks fastened upon the back part of the rudder, with their points downwards, in order to enter into, and rest upon, the googings, fixed in the stern-post, to hang the rudder. See **HELM**.

PINTOR (Peter), born at Valencia in Spain, in the year 1420, was physician to Alexander VI. whom he followed to Rome, where he practised with great success. He has left behind him two performances of considerable merit, 1. *Aggregator Sententiarum Doctorum de Curatione in Pestilentia*, printed at Rome 1499, in folio. 2. *De Morbo Fædo et Occulto his Temporibus affligenti*, &c. printed at Rome, 1500, in 4to, black letter; a book extremely scarce, unknown to Luisini and Astruc, and which traces the venereal disease to the year 1496. Pintor died at Rome in 1503, aged 83 years.

PINULES. *s.* In practical astronomy, the sights of an astrolabe.

PINTURICCIO (Bernardino), a celebrated Italian painter, born at Perugia in 1454: and the inventor of a new way of painting to represent the basso relievo of architecture. He principally painted history, though he excelled in portraits. His greatest work was in the library of Sienna. He died in 1513.

PINUS, in botany, a genus of the class monœcia, order monadelphia. Male: calyx a peltate scale of the ament; corolless; anthers growing to the scales, sessile. Female: calyx a two-flowered scale of the cone; corolless; nuts two under each scale, winged. Thirty-three species; a few Asiatic, more European; most American trees. They may be thus distinguished into two sections.

A. Leaves numerous from the same sheathing base; constituting the tribe of firs.

B. Leaves solitary surrounding the branches; the tribe of pines.

The following are those chiefly worthy of notice.

1. *P. sylvestris*. Scotch fir. Leaves in pairs, rigid; younger cones peduncled, recurved, dependent; anthers with a minute crest. This tree yields a red or yellow deal of great durability: grows wild in Scotland.

2. *P. pinaster*. Wild pine. Lofty tree, with wide spreading branches, which when young, and especially if exposed to a free influx of air, are full of leaves, but become bald by age, or when in a confined spot. The tree has then in its lower and older branches a very unsightly appearance. A native of the south of Europe.

3. *P. pinea*. Stone-pine tree. Leaves in pairs; cones ovate, very large; seeds with very short wings; anthers with a jagged toothed crest, kidney-form. A native of the south of Europe.

4. *P. strobus*. Weymouth pine. Leaves in fives; cones cylindrical, smooth, longer than the leaves; anthers with a double subulate minute crest. A native of North America. It rises often to the height of a hundred feet, and is peculiarly valuable for its elegance. The bark is smooth and delicate; and the

wood employed for masts of ships. Within the last half century it has been very largely propagated in England.

5. *P. abies*. Spruce fir. Leaves solitary, square; cones cylindrical, the tops rhombic, flattened, repand, and notched at top. A native of Europe and Asia. This species includes the Norway spruce, and long-coned Cornish fir. The former is equally valuable for its beauty as a tree as for its wood, when cut for timber; it forms the white deal of the joiners, and produces the common pitch of the shops. Its shaft is upright and very tall. The cones are pendulous, eight or ten inches long.

6. *P. picea*. Silver fir. Leaves solitary, flat, a little inclining to one side, glaucous; branches horizontal; bractes twice as long as the scale; cones cylindrical, erect, sessile; scales very obtuse, with ciliate teeth at the sides; crest of the anthers two-horned. A native of the Alps; very hardy, and will grow in any situation, but always makes the greatest progress in a rich loamy soil, with space for its roots to strike out freely.

7. *P. balsamea*. Balm of Gilead fir. Leaves solitary, flat, a little inclining to one side; cones cylindrical, erect, with short bractes; crest of the anthers not horned. A native of Virginia. This species has been more coveted than any of the tribe; its leaves are highly fragrant; it is also a beautiful upright tree, with branches as ornamental in their regularity as they are desirable for their odour. It requires a deep rich earth, and will not flourish in any other.

8. *P. cedrus*. Cedar of Lebanon. Leaves fascicled, perennial; cones ovate, obtuse, erect, with oppressed, rounded scales. This is also an elegant and odoriferous species. Its wood is sometimes counterfeited by dying other close-grained timber of the same hue; but the want of fragrance detects the cheat at once. The wood of the cajon tree is sometimes passed for cedar from its reddish colour and aromatic smell, in which, however, it more nearly resembles santal wood. Cedar is reputed almost incorruptible; and in truth its bitter taste effectually preserves it from worms that prey upon wood generally. Among the ancients a juice was obtained from this wood with which they varnished or at least stained their books, writings, and other materials, to preserve them from rotting.

It is a native of Syria, chiefly about Mount Libanus; nor has it yet been found any where else as an indigenous plant. The cedar of Lebanon mentioned in the scriptures, however, does not appear to have been the species before us: since the former is characterised as being peculiarly lofty, a term which by no means applies to the cedar now existing on that mountain as described by modern travellers, which, like those of the same name grown in Europe, spread very wide, but by no means grow very lofty. Maundrel remarks, that when he visited mount Libanus there were but sixteen large trees, some of which were of a prodigious bulk; but there were many young trees of a much smaller size. He measured one of

P I N U S.

the largest, and found it to be twelve yards six inches in girth, and thirty-seven yards in the spread of its branches; it is probable, however, that by the word spread, this writer means diameter.

9. *P. larix*. Larch. Leaves fascicled, deciduous; cones ovate-oblong; margins of the scales reflected, jagged; bractes guitar-shaped. It is a native of the Alps, with branches pendulous at the tips and ascending cones: grows quickly, and reaches fifty feet high.

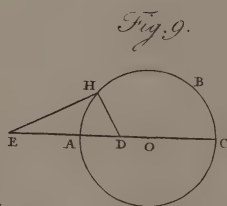
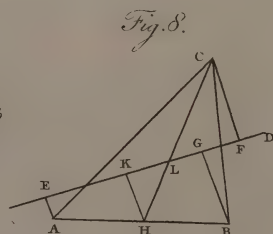
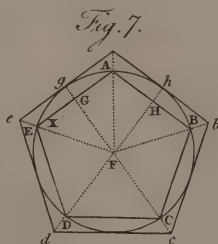
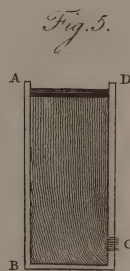
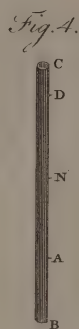
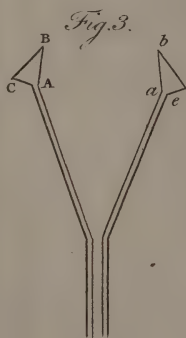
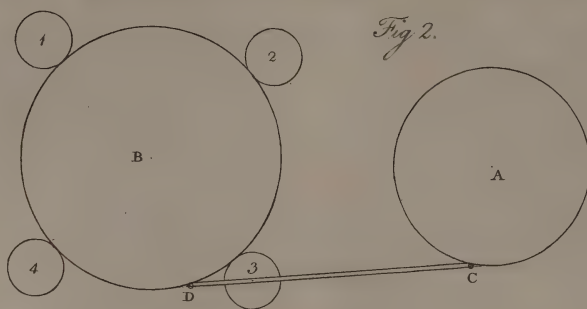
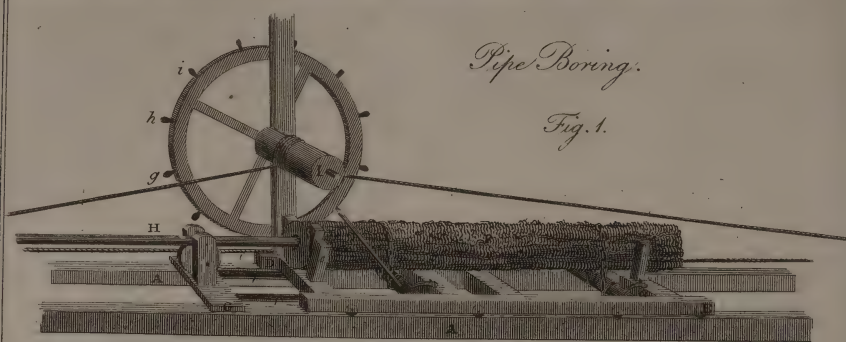
From the larch-tree is extracted what we erroneously call Venice turpentine. This substance, or natural balsam, flows at first without incision; and when it has done dropping, the poor people who wait in the fir woods make incisions at about two or three feet from the ground into the trunks of the trees, into which they fix narrow troughs about twenty inches long. The end of these troughs is hollowed like a ladle; and in the middle is a small hole bored for the turpentine to run into the receiver which is placed below it. As the gummy substance runs from the trees, it passes along the sloping gutter or trough to the ladle, and from thence runs through the hole into the receiver. The people who gather it visit the trees morning and evening from the end of May to September, to collect the turpentine out of the receivers. When it flows out of the tree, Venice turpentine is clear like water, and of a yellowish white, but as it grows older, it thickens and becomes of a citron colour. It is procured in the greatest abundance in the neighbourhood of Lyons, and in the valley of St. Martin, near St. Lucern in Switzerland.

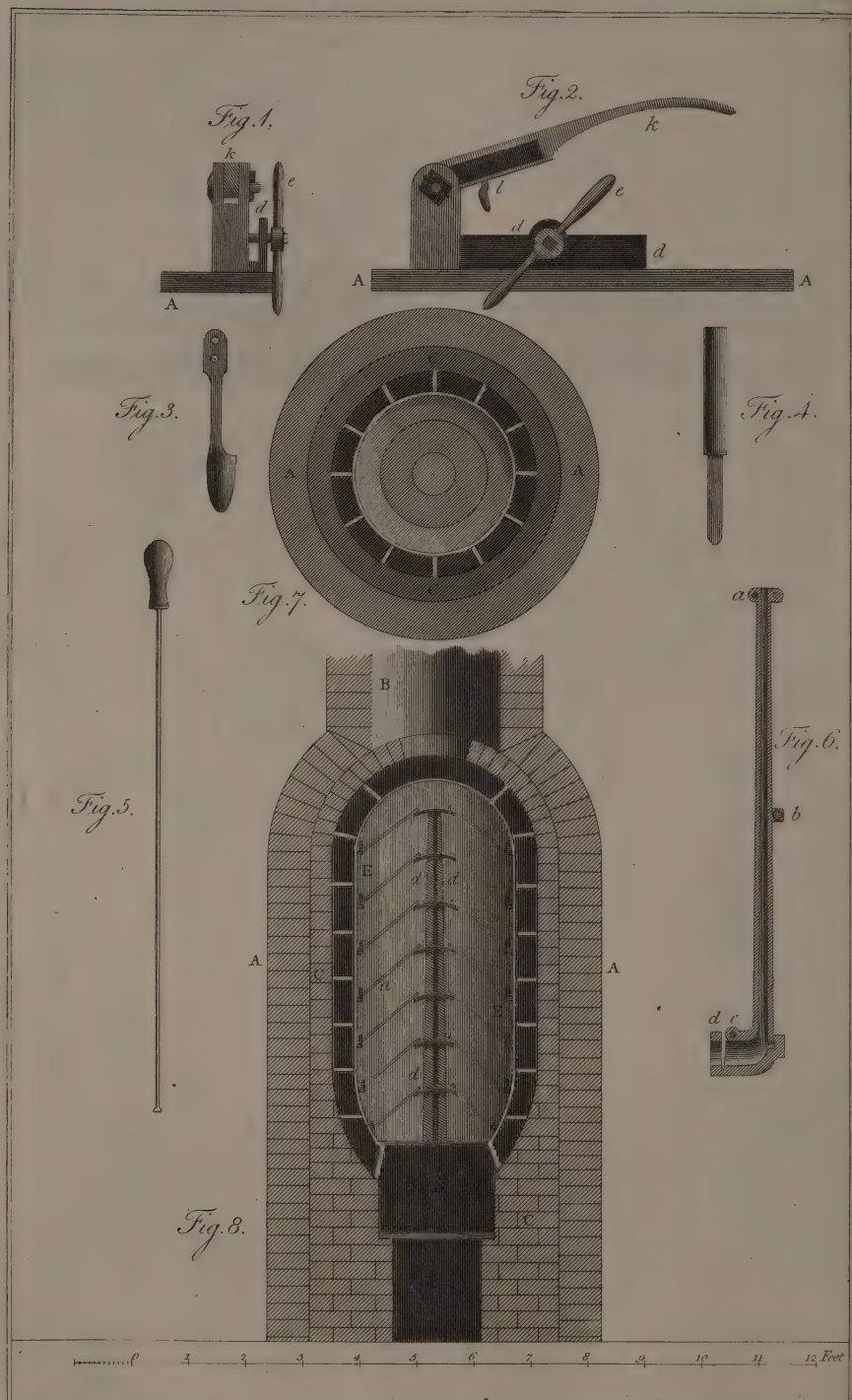
All sorts of pines are propagated by seeds produced in hard woody cones. The way to get the seeds out of these cones is to lay them before a gentle fire, which will cause the cells to open, and then the seeds may be easily taken out. If the cones are kept entire, the seeds will remain good for some years; so that the surest way of preserving them is to let them remain in the cones till the time for sowing the seeds. If the cones are kept in a warm place in summer, they will open and emit the seeds; but if they are not exposed to the heat, they will remain close for a long time. The best season for sowing the pines is about the end of March. When the seeds are sown, the place should be covered with nets to keep off the birds; otherwise, when the plants begin to appear with the husk of the seed on the top of them, the birds will peck off the tops, and thus destroy them.

From the first species is extracted the common turpentine, much used by farriers, and from which is drawn the oil of that name. The process of making pitch, tar, rosin, and turpentine, from these trees, is this: in the spring time, when the sap is most free in running, they pare off the bark of the pine tree, to make the sap run down into a hole which they cut at the bottom to receive it. In the way, as it runs down, it leaves a white matter like cream, but a little thicker. This is very different from all the kinds of resin and tur-

pentine in use; and is generally sold to be used in the making of flambeaux, instead of white bees' wax. The matter that is received in the hole at the bottom is taken up with ladles, and put in a large basket; a great part of this immediately runs through, and this is the common turpentine. This is received into stone or earthen pots, and is ready for sale. The thicker matter, which remains in the basket, they put into a common alembic, adding a large quantity of water. They distil this as long as any oil is seen swimming on the water. This oil they separate from the surface in large quantities, and this is the common oil or spirit of turpentine. The remaining matter at the bottom of the still is common yellow resin. When they have thus obtained all they can from the sap of the tree, they cut it down; and hewing the wood into billets, they fill a pit dug in the earth with these billets; and setting them on fire, there runs from them, while they are burning, a black thick matter. This naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, out at which the tar runs like oil. If this hole is made too large, it sets the whole quantity of the tar on fire; but if small enough, it runs quietly out. The tar being thus made, is put up in barrels; and if it is to be made into pitch, they put it into large boiling vessels, without adding any thing to it. It is then suffered to boil awhile, and being then let out, is found when cold to be what we call pitch.

A decoction of the nuts or seeds of the first species in milk, or of the extremities of the branches pulled in spring, is said, with a proper regimen, to cure the most inveterate scurvy. The wood of this species is not valued; but that of the Scots pine is superior to any of the rest. It is observable of the Scots pine, that when planted in bogs, or in moist soil, though the plants make great progress, yet the wood is white, soft, and little esteemed; but when planted in a dry soil, though the growth of the trees is there very slow, yet the wood is proportionably better. Few trees have been applied to more uses than this. The tallest and straightest are formed by nature for masts to our navy. The timber is resinous, durable, and applicable to numberless domestic purposes, such as flooring and wainscoting of rooms, making of beds, chests, tables, boxes, &c. From the trunk and branches of this, as well as most others of the pine tribe, tar and pitch are obtained. By incision, barras, Burgundy pitch, and turpentine, are acquired and prepared. The resinous roots are dug out of the ground in many parts of the Highlands, and being divided into small splinters, are used by the inhabitants to burn instead of candles. At Loch Broom, in Rosshire, the fishermen make ropes of the inner bark; but hard necessity has taught the inhabitants of Sweden, Lapland, and Kamtschatka, to convert the same into bread. To effect this, they, in the spring season, make choice of the tallest and





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fairest trees, then stripping off carefully the outer bark, they collect the soft, white, succulent, interior bark, and dry it in the shade. When they have occasion to use it, they first toast it at the fire, then grind, and after steeping the flour in warm water to take off the resinous taste, they make it into thin cakes, which are baked for use. On this strange food the poor inhabitants are sometimes constrained to live for a whole year; and we are told, through custom, become at last even fond of it. Linnéus remarks that this same bark bread will fatten swine; and humanity obliges us to wish that men might never be reduced to the necessity of robbing them of such a food. The interior bark of which the above mentioned bread is made the Swedish boys frequently peel off the trees in the spring, and eat raw with a greedy appetite. From the cones of this tree are prepared a diuretic oil, like the oil of turpentine, and a resinous extract, which has similar virtues with the balsam of Peru. An infusion or tea of the buds is highly commended as an antiscorbutic. The farina, or yellow powder, of the male flowers, is sometimes in the spring carried away by the winds, in such quantities, where the trees abound, as to alarm the ignorant with the notion of its raining brimstone. The tree lives to a great age; Linnéus affirms, to 400 years.

PIOMBINO, a small principality of Italy, on the coast of Tuscany, to which was annexed the island of Elba, separated by a channel seven miles broad. It had its own prince, under the protection of Naples; but the continental part now belongs to Etruria, and the island to France.

PIOMBINO, a seaport of Italy, capital of the principality of the same name. It has a good harbour, defended by a citadel, and is seated on a peninsula, 40 miles S.E. of Leghorn. Lon. 10. 23 E. Lat. 42. 57 N.

PIONEERS, in the art of war, are such as are commanded in from the country, to march with an army for mending the ways, for working on intrenchments and fortifications, and for making mines and approaches. The soldiers are likewise employed for all these purposes. Most of the foreign regiments of artillery have half a company of pioneers, well instructed in that important branch of duty. Our regiments of infantry and cavalry have about twenty pioneers each, provided with aprons, hatchets, saws, spades, and pick-axes. Each pioneer must have an ax, a saw, and an apron; a cap with a leather crown, and a black bear-skin front, on which is to be the king's crest in white, on a red ground; and the number of the regiment is to be on the back part of it.

PIONING. *s.* Works of pioneers (*Spen.*).

PIOUS. *a* (*pius*, Lat. *pieux*, Fr.) 1. Careful of the duties owed by created beings to God; godly; religious; such as is due to sacred things (*Milton*). 2. Careful of the duties of near relation (*Taylor*). 3. Practised under the appearance of religion (*King Charles*).

PIOUSLY. *ad.* (from *pious*.) In a pious

PIP

manner; religiously; with such regard as is due to sacred things (*Philips*.)

PIP, or **PEP** (*pepia*), a disease among poultry, consisting of a white thin skin, or film, that grows under the tip of the tongue, and hinders their feeding. It usually arises from want of water, or from drinking puddle-water, or eating filthy meat. It is cured by pulling off the film with the fingers, and rubbing the tongue with salt. Hawks are particularly liable to this disease, especially from feeding on stinking flesh.

PIP, a spot on the cards.

To PIP. *v. n.* To chirp or cry as a bird (*Boyle*).

PIPE, in building, &c. a canal, or conduit, for the conveyance of water and other fluids. Pipes for water, water-engines, &c. are usually of lead, iron, earth, or wood: the latter are commonly made of oak or elder. Those of iron are cast in forges; their usual length is about two feet and a half; several of these are commonly fastened together by means of four screws at each end, with leather or old hat between them, to stop the water. Those of earth are made by the potters; these are fitted into one another, one end being always made wider than the other. To join them the closer, and prevent their breaking, they are covered with tow and pitch: their length is usually about that of the iron pipes. The wooden pipes are trees bored with large iron augurs, of different sizes, beginning with a less, and then proceeding with a larger successively; the first being pointed, the rest formed like spoons, increasing in diameter, from one to six inches or more: they are fitted into the extremities of each other, and are sold by the foot.

PIPE-BORING. *AA*, Plate 139, fig. 1, are two beams laid on each side of a pit, into which the chips are to fall. Upon the edges of these, the wheels of a frame *DE* run. This frame has four pieces, *ddaa*, across it; and two windlases, *bb*, which have chains round them, going over the piece of timber *F* which is to be bored. The two end-pieces *dd* have uprights *ee* in them; between which the tree is laid, and is secured with wedges in different places as the occasion requires. *G* is a piece lying across the two beams *AA*: this is connected with the frame *DE* by two iron bars *ff*, which are fastened to it; and go through holes in the piece *d*, and are held there by pins put through holes in both. The piece *G* has two uprights in it, between which is a brass pulley to support the weight of the boring-bar *H ghi* is a wheel, with handles on its circumference to turn it by; on its axis *I* a rope is coiled; one end of which goes over a pulley (not seen), and is fastened to the carriage *DE*. At *i* the other end goes over a similar pulley, and is tied to the other end of the carriage *DE*. The machine is put into some place where there is a crane, by which the tree can be lifted upon the carriage; first withdrawing the carriage from the boring-bar, by turning the wheel from *g* to *i*, and separating it from the piece *G*

by taking out the pins. It is then wedged into its place, and secured by the windlasses *bb*. The wheel is next turned back, the carriage drawn up to the borer, and the piece *G* pinned in. The machine (either horses, water, steam, &c.) which turns the borer is then set to work; and a man constantly attends at the wheel *ghi*, to draw the pipe up to the borer. The use of the wheel in the piece *G* is, to support the borer just where it enters the pipe, and make it work steady. When the pipe is bored through, it is withdrawn, and another tree is placed on the carriage as before.

The company for the Manchester water-works employ stone pipes for the communication of the water. The stone which they have found as most suitable to their purpose, is in a quarry at Fox Hill, in the parish of Guiting Power, Gloucestershire. The stone is much of the same quality as Portland stone, though not quite so dense, the Fox Hill stone requiring 17 cubic feet to weigh a ton, while the Portland stone requires only 16 feet.

The works at Fox Hill for the purpose of boring the stone are ingeniously constructed. The first mover is a steam engine of considerable power, giving rotatory motion to a shaft posited horizontally, and running from one end of the works to the other. The works are divided into compartments, each of which serves for the simultaneous boring of four pipes. By means of the usual contrivance of bevel-gear motion is communicated from the main horizontal shaft, to a vertical arbor, at the top of which is the wheel *A* (fig. 2. pl. 139). The rotatory motion of this wheel by means of a crank bar *CD*, gives a reciprocating motion to the larger wheel *B*, and this latter motion is such as to give rather more than a complete rotation to each of four smaller wheels, 1, 2, 3, 4, placed diametrically opposite, with respect to the larger wheel *B*, the mutual connection between them and it being by means of teeth or cogs. Thus the wheels 1, 2, 3, 4, go through somewhat more than a complete rotation in one direction, and then rather more than a complete rotation in the opposite direction; and so on alternately. On the vertical shafts beneath the wheels 1, 2, 3, 4, are placed iron tubes which are suffered to act by their weights upon the stones to be bored, and by means of their rotation to bore those stones by attrition. The stones are cut into lengths of 6 or 8 feet, and bored into pipes of various diameters. When the pipes are of 14 inches diameter, the thickness of stone allowed is about 5 inches. The tubes by which the boring is effected are then of course 14 inches diameter, and weigh about $1\frac{1}{2}$ cwt. They are made of thin plate iron, except their circular rim or sole at the bottom, which is about half an inch thick. As the attrition wears away the stones on which the soles of the tubes rest, they sink lower and lower; the whole is kept moist by means of a semifluid mixture of sand and water, which runs down from the wheels 1, 2, 3, 4, at top of the tubes, and after sinking to the bottom of those tubes, carries up with it the particles of

the stone taken off during the process of boring. Thus the boring proceeds with tolerable rapidity. The principal defect we saw in the machinery was in the jostling occasioned by the bar *CD* on every reciprocation of the wheel *B*: but this may be easily remedied.

Previously to the adoption of these tubes for boring, the work was effected by the circular saws invented by sir James Wright: but these saws were soon abandoned, by reason of their frequent derangement, when multiplied and worked by machinery.

PIPES OF AN ORGAN. See ORGAN.

PIPES (Tobacco), are made of various fashions; long, short, plain, worked, white, varnished, unvarnished, and of various colours, &c. The Turks use pipes three or four feet long, made of rushes, or of wood bored, at the end whereof they fix a kind of pot of baked earth, which serves as a bowl, and which they take off after smoking. With us the tobacco pipe manufactory is a branch of pottery; but the methods being essentially different from any other, and very ingenious, deserve a more particular notice than at first sight might be imagined.

The clay of which tobacco pipes are made is perfectly white, and is distinguished from other kinds of clay by its great adhesion to the tongue, which is well known to be very considerable when baked, in consequence of its affinity for water; in the raw state this property is perceptible in a slight degree. The pipe clay is found at Maidenhead, in Kent, in large lumps, which are purified by dissolving them in water in large pits; this solution being well stirred up, is poured off into another, where it subsides and deposits the clay; the water becoming clear is run off, and the clay at the bottom is left till sufficiently dry for use; by this means the smallest stones or particles of foreign matter are left at the bottom of the first pit; the clay thus prepared, is spread on a board and beaten with an iron bar, to temper and mix it; then it is divided into pieces, each of which will be the proper size to form a tobacco pipe; each of these pieces is rolled under the hand into a long roll with a bulb at one end to form the bowl, and in this state they are laid up in parcels for a day or two, until they become sufficiently dry for pressing, which is the next process, and is conducted in the following manner. The roll of clay has a small wire (fig. 5. pl. 138) thrust nearly through its whole length to form the tube, and is put in between two iron moulds, one of which is shown in fig. 6. of the same plate, 138. each has imprinted in it the figure of one half of a pipe, and therefore when put together, the cavity between them is the figure of a whole pipe. They are put together by 3 pins at *a, b, c*, which enter holes in the opposite half. The moulds, with the clay in them, are now put into the press, figs. 1. and 2. It consists of an iron frame formed of two plates like *dd*, one of which is fixed down to the bench *AA*, and the other is pressed towards it by a screw, turned round by the handle *e*. The

moulds are put in between the two plates, and the screw being turned round presses them together, imprinting the figure of a pipe on the clay included between them. The lever *k* is next depressed, and the stopper *l* (shown enlarged in fig. 3.) entering the mould, forms the bowl of the pipe, and the wire, fig. 5. which is all the while in the pipe, is thrust backwards and forwards to prick the tube completely into the bowl. The press is now opened by turning back the screw *e*, and the moulds taken out. The knife, fig. 4. is thrust into the cleft *d* fig. 6. of the mould to cut the end of the bowl flat, the wire is carefully withdrawn, and the pipe taken out of the mould. These pipes are laid up 2 or 3 days, till they become stiff, when they are dressed with curved scrapers to take off the impression of the joints of the moulds, and they are polished and smoothed by rubbing them with a piece of hard wood cut with a semicircular cleft. They are then baked in the furnace, figs. 7 and 8. It is built within a cylinder of brickwork AA, having a dome at top, and a chimney B arising from it to a great height, to cause a sufficient draught. Within this is a lining of fire brick marked CC, having the fire-place D, at the bottom of it. The pot or crucible EE, which contains the pipes, is formed of broken pieces of pipes, and cemented together by fresh clay and hardened by burning. This crucible has a number of vertical flues surrounding it, as shown in the plan fig. 7, and conducting the flame from the fire grate up to the dome of the fire brick lining CC, and through a hole in its dome into the chimney. Within the crucible several projecting rings are made, and upon these the bowls of the pipes are supported as in the figure at *aa*; the ends resting upon circular pieces of pottery which stand on small loose pillars *dd* set up for the purpose in the center. By this arrangement a small crucible can be made to contain 50 gross of pipes, and without loading them one upon the other so as to endanger the crushing or deforming any by the weight of the others. The pipes are put into the pot at one side where the crucible is open, but when filled, this orifice is made up with broken pipes and fresh clay. The fire brick lining CC is also made good on that side, and the furnace is lighted. At first the heat is gentle, but is increased by degrees to the proper temperature, and continued for 7 or 8 hours; when it is damped by stopping the hole in the crown of the lining CC with a flat plate of fire clay.

When the furnace is cold the pipes thus baked are ready for sale.

PIPE, also denotes a vessel or measure for wine, and things measured by wine-measure. It is usually reckoned two hogsheds, or 126 gallons: this is the measure found in books, but in actual life it is very different.

Gallons.

The pipe of Port is	- - - - -	138
The pipe of Madeira is	- - - - -	110
The pipe of Vidonia is	- - - - -	120
The pipe of Sherry is	- - - - -	130
The pipe of Lisbon, and Bucellas, is	- 140	

The pipe of port is seldom accurately 138 gallons, and it is customary in trade to charge what the cask actually contains, be it more or less than the estimated quantity.

PIPE, in music, any tube formed of a reed, or of wood, metal, &c. which being inflated at one end produces a musical sound, acute or grave, soft or loud, according to the material, its form, and dimensions. The pipe, which was originally no more than a simple oaten straw, formed one of the first instruments by which melodious sounds were attempted.

PIPES OF PAN, or MOUTH ORGAN, a wind instrument consisting of a range of pipes bound together side by side, and gradually lessening with respect to each other in length and diameter. The longest is about six inches, and the shortest only two in length. In performing upon this instrument, it is held in the hand, and the pipes are blown into by the mouth at the upper end. This is the syrinx or fistula of Theocritus, Lucretius, and Virgil.

PIPE, in law, a roll in the exchequer, otherwise called the *great roll*, whence there is an office called the pipe office, where they take cognizance of estreats and forfeitures to the King. The clerk of the pipe makes out leases of crown lands, by warrant from the lord-treasurer, or commissioners of the treasury, or chancellor of the exchequer. The clerk of the pipe makes out also accounts of sheriffs, &c. and gives the accomptants their *quietus est*. To this office are brought all accounts which pass the remembrancer's office, and remain there, that if any stated debt is due from any person, the same may be drawn down into the great roll of the pipe; upon which the comptroller issues out a writ, called the summons of the pipe, for recovery thereof; and if there are no goods or chattels, the clerk then draws down the debts to the lord-treasurer's remembrancer, to write estreats against their lands. All tallies which vouch the payment of any sum contained in such accounts are examined and allowed by the chief secondary of the pipe. Besides the chief clerk in this office, there are eight attorneys, or sworn clerks, and a comptroller.

PIPE (Wind). See TRACHEA.

To PIPE. *v. n.* (from the noun.) 1. To play on the pipe (*Camden*). 2. To have a shrill sound (*Shakspeare*.)

PIPE, in botany. See SYRINGA.

PIPE-TREE FUDDING. See CASSIA.

PIPE-CLAY, in mineralogy, a species of the argillaceous earth called argil. See ARGILLA.

PIPE-FISH, in ichthyology. See SYNGNA-THUS.

PIPER, a performer on a pipe. Pipers were formerly one of the class of itinerant musicians, and performed on a variety of wind instruments: as the bag-pipe, musette, court-taut, &c.

PIPER. Pepper. In botany, a genus of the class diandria, order trigynia. Calyxless; corollless; berry one-seeded. Fifty-one species, chiefly West Indian or American plants; some, natives of the East Indies; a few of

the Cape. The following are those chiefly noticeable.

1. *P. nigrum*. Leaves ovate, mostly seven-nerved, glabrous; petioles very simple. A native of India, with trailing stem, rooting at the joints; leaves ovate, alternate, mostly seven-nerved, glabrous, or sheath-like foot-stalks; flowers sessile, lateral and terminal. The berries are the common black pepper; and when deprived of their skin and steeped in water, they constitute white pepper.

2. *P. betle*. Betel. Stems striate-angular; leaves ovate, rather oblong, pointed, seven-nerved, alternate; petioles two-toothed, channelled; spike cylindrical. A native of India, cultivated by props like the vine; the areca is a common prop; and the leaves inclosing a few bits of areca which correct their bitterness, are universally chewed by the Asiatics, and form a common present from friend to friend. It would be a breach of politeness among the Indians to take leave for any long time without presenting each other with a purse of betel. No one dares speak to a superior unless his mouth is perfumed with betel. Women of gallantry are most lavish in the use of it. It is taken after meals, and chewed during a visit. It is certainly prejudicial to the teeth; but is said to strengthen the stomach.

3. *P. siriboa*. Leaves heart-shaped, mostly seven-nerved, veined, alternate, acute; spikes axillary, slender. This is also a native of India, and yields a pepper of a similar kind to *P. nigrum*. The pepper is produced from white flower-buds, and at first resembles bunches of currants, about twenty or thirty being in a bunch.

4. *P. cubeba*. Stem jointed, flexuous; leaves unequal at the base. The pedicelled berries are the cubebæ of the shops. It is a native of Java and Guinea. For the medical properties of its berries, see *CUBEBÆ*.

5. *P. longum*. Stems shrubby, climbing; leaves heart-shaped, entire, alternate. The long pepper of the shops. A native of India.

6. *P. methysticum*. Stem forked, spotted; leaves oblong, heart-shaped; spikes axillary, solitary, straight. The root bruised, and chewed, and mixed with the saliva, forms the intoxicating juice called *ava*, which is so agreeable to the natives of the South Sea Islands, to which the plant is indigenous.

About eight species of this genus are cultivated in our own conservatories by seeds procured fresh from the countries to which the plants respectively belong.

PIPER, in ichthyology. See *TRIGLA*.

PIPER INDICUM. Capsicum. *Piper Braziliannum*. *Piper Guineense*. *Piper Calcutticum*. *Piper Hispanicum*. *Piper Lucitanicum*. Cayenne pepper. Guinea pepper. This species of pepper is obtained from the capsicum annuum; caule herbaceo, pedunculis solitariis of Linnæus. *C. O. Pentandria*. *Monogynia*. As an aromatic of the stimulant kind, it is efficacious in some paralytic and gouty cases, or to promote excitement where the bodily organs are languid and torpid.

PIPER JAMAICENSE. See *PIMENTO* and *MYRTUS*.

PIPERIDGE TREE. See *BERBERIS*.

PIPERITÆ. (*piper*, pepper.) The name of the first order in Linnæus's Fragments; and of the second, in his Natural Orders.

PI'PING. *a.* (from *pipe*.) 1. Weak; feeble; sickly (*Shakspeare*). 2. Hot; boiling.

PI'PKIN. *s.* (diminutive of *pipe*.) A small earthen boiler (*Pope*).

PIPPIN. *s.* (*puppynghe*, Dutch. *Skinner*.) A sharp apple. See *PYRUS*.

PIPRA. Manakin. In zoology, a genus of the class aves, order passeræ. Bill shorter than the head, strong, hard, nearly triangular at the base, and slightly incurved at the tip; nostrils naked; feet gressorial; tail short. Thirty-one species; inhabitants of the warm climates of Asia, Africa, and America. The following are chiefly worthy of notice.

1. *P. rupicola*. Rock or crested manakin. Crest erect, edged with purple; body saffron; tail-coverts truncate. Inhabits the rocky parts of South America; size, that of a small pigeon; from ten to twelve inches long; shy, but may be tamed if taken young; feeds on small wild fruits, and builds in the clefts of the remotest rocks; eggs two, white. The bill is yellowish; crest consists of a double series of feathers; quill-feathers partly white, partly brown; tail-feathers twelve, upper half of the ten middle ones orange, lower half brown, outer ones brown; legs yellow. Female and young birds brown; lower wing-coverts rufous-orange.

2. *P. musica*. Tuneful manakin. Black, beneath orange; front and rump yellow; crown and nape blue; chin and throat, bill and legs, black. Inhabits St. Domingo; four inches long; is very shy, and easily eludes the vigilance of such as attempt to take it, by perpetually shifting, like the creeper, to the opposite branches of the tree: its note is musical, and forms a complete octave, one note regularly succeeding another.

PI'QUANCY. *s.* (from *piquant*.) Sharpness; tartness.

PI'QUANT. *a.* (*piquant*, French.) 1. Pricking; piercing; stimulating (*Addison*). 2. Sharp; tart; pungent; severe (*Bacon*).

PI'QUANTLY. *ad.* Sharply; tartly (*Locke*).

PIQUE. *s.* (*pique*, French.) 1. An ill will; an offence taken; petty malevolence (*Decay of Piety*). 2. A strong passion (*Hudibras*). 3. Point; nicety; punctilio (*Dryden*).

To *PIQUE*. *v. a.* (*piquer*, French.) 1. To touch with envy or virulency; to put into fret; to kindle to emulation (*Prior*). 2. To offend; to irritate (*Pope*). 3. To value; to fix reputation as on a point (*Locke*).

To *PIQUEER*. See To *PICKEER*.

PIQUEERER. *s.* A robber; a plunderer; rather *pickeerer* (*Swift*).

PIQUET. See *PICQUET*.

PIQUETRA, in botany, a genus of the

class syngenesia, order polygamia æqualis. Receptacle naked; calyx four-leaved, equal, four-flowered; downless; seeds five-sided. One species; a Mexico plant with white flowers.

PIQUETTES, in botany. See **DIANTHUS**.

PIRACY. *s.* (*ωιγαλμα*.) The act or practice of robbing on the sea (*Waller*).

PIRÆUS, or **PIREUS**, a celebrated harbour at Athens, at the mouth of the Cephissus, about three miles distant from the city. It was joined to the town by two long walls, one of which was built by Themistocles, and the other by Pericles. It was the most capacious of all the harbours of the Athenians, and was made sufficiently commodious for the reception of a fleet of 400 ships in the greatest security. Its walls and fortifications were totally demolished by Lysander.

PIRANESI (Giambattista), an architect and engraver of Venice. He was born about 1711, and was remarkable for a bold and free style of etching, which he generally drew upon the plate at once. He died in 1780.

PIRATE. (*ωιγατης*, Gr.) A sea-robber, or an armed ship that roams the seas without any legal commission, and seizes or plunders every vessel she meets indiscriminately, whether friends or enemies.

The colours usually displayed by pirates are said to be a black field, with a death's head, a battle-axe, and hour-glass. The last instrument is generally supposed to determine the time allowed to the prisoners, whom they take, to consider whether they will join the pirates in their felonious combination, or be put to death; which is often perpetrated in the most cruel manner.

By stat. 28 H. VIII. c. 15, all treasons, felonies, robberies, murders, and confederacies committed upon the sea, or in any haven, creek, or place where the admiral has jurisdiction, shall be tried in such shires or places as the king shall appoint by his commission in like forms, as if such offence had been committed upon land, and according to the course of the common law, and the offenders shall suffer death without benefit of clergy. And by stat. 6 Geo. I. made perpetual, it is enacted, that if any of his majesty's natural-born subjects, or denizens of this kingdom, shall commit any piracy or robbery, or any act of hostility, against other his majesty's subjects upon the sea, under colour of any commission from any prince or state, or pretence of authority from any person whatsoever, such offender shall be deemed to be a pirate, felon, and robber; and being duly convicted thereof according to this act, or the aforesaid act of 23 Hen. VIII. shall have and suffer such pains of death, loss of lands, goods, and chattels, as pirates, felons, and robbers upon the seas, ought to have and suffer. By 18 Geo. II. c. 30. persons committing hostilities, or aiding enemies at sea, may be tried as pirates. Piracies at sea are excepted out of the general pardon, by 20 Geo. II. c. 52.

Pirate's goods go to the admiral by grant; but not piratical goods, which go to the king if the owner is not known.

To **PIR'ATE**. *v. n.* (from the noun.) To rob by sea (*Arbutnot*).

To **PIR'ATE**. *v. a.* (*pirater*, Fr.) To take by robbery (*Pope*).

PIRATICAL. *a.* (*piraticus*, Latin.) 1. Predatory; consisting in robbery (*Bacon*). 2. Practising robbery (*Pope*).

PIRENE, in fabulous history, a daughter of Cebalus, or according to others, of the Achelous. She had by Neptune two sons called Leches and Cenchrius, who gave their name to two of the harbours of Corinth. Pirene was so disconsolate at the death of her son Cenchrius, who had been killed by Diana, that she pined away, and was dissolved by her continual weeping into a fountain of the same name at Corinth. This fountain was sacred to the Muses.

PIRITHOUS, in fabulous history, a son of Ixion and the cloud. Some make him son of Dia, by Jupiter, who assumed the shape of a horse whenever he paid his addresses to his mistress. He was king of the Lapithæ, and he wished to become acquainted with Theseus king of Athens, of whose exploits he had heard so much. To be a witness of his valour, he resolved to invade his territories, and Theseus immediately met him on the borders of Attica; but their meeting, instead of proving hostile, was like that of the most cordial friends, and Pirithous promised to repair the damages which his hostilities occasioned. From that time the two monarchs became so attached, that their friendship, like that of Orestes and Pylades, is proverbial. Pirithous some time after married Hippodamia, and invited not only heroes, but also the gods themselves, and his neighbours the centaurs, to celebrate his nuptials. Mars was the only god not invited. He therefore determined to raise a quarrel, and to disturb the festivity of the entertainment. Eurythion, intoxicated with wine, attempted to offer violence to the bride, but he was prevented by Theseus, and immediately killed. This irritated the rest of the centaurs, and the contest became general. Many of the centaurs were slain, and the rest saved their lives by flight. (See **LAPITHUS**.) After the death of Hippodamia, Pirithous and Theseus carried off Helen, who fell to the lot of Theseus. Pirithous upon this undertook with his friend to carry away Proserpine and to marry her. They descended into the infernal regions, but Pluto stopped the two friends, and confined them there. Pirithous was tied to his father's wheel, or according to Higynus, he was delivered to the Furies to be continually tormented; but when Hercules visited the kingdom of Pluto, he obtained the pardon of Pirithous, and brought him back unhurt. Some suppose that he was torn to pieces by the dog Cerberus. (See **THESEUS**.)

PIRMASENS, a town of France, in the department of Mont Tonnere, lately of Germany, in the duchy of Deux Ponts. Near

this place, in 1793, the French were defeated by the Prussians. It is 13 miles E. of Deux Ponts.

PIRNA, a town of Upper Saxony, in Misnia. It has a castle on a mountain, called Sonnenstein, which was almost destroyed by the Prussians in 1756 and 1758, and is now an asylum for invalids, &c. It is a place of considerable trade, situate on the Elbe, 12 miles S.E. of Dresden.

PISA, a city of Tuscany, capital of the Pisano, and an archbishop's see, with a famous university, and three forts. The river Arno runs through Pisa, and over it are three bridges, one of which is constructed of marble; and there is a canal hence to Leghorn. This city formerly contained 100,000 inhabitants, but there are not at present above 22,000, so that grass grows in some of the streets. The manufactures consist of steel, jewellery, embroidery, damasks, velvet, taffeta, and calico. The cathedral is a magnificent structure, and on the right side of the choir is a leaning tower, much noticed by travellers. There are upward of 80 more churches, and that of St. Stephen, belonging to an order of knights, is deserving of notice. The other remarkable buildings are the palaces of the grand duke and archbishop, the arsenal, the great hospital, and the magnificent exchange, which last is almost superfluous, as the trade of Pisa is removed to Leghorn. But one of the most extraordinary objects here is the campanile, or leaning tower, erected in a square close to the great church. It is composed wholly of white marble, and was built for the purpose of containing the bells. Its height is about 200 feet, and its inclination nearly fifteen feet from the perpendicular. Mr. Tappen, who has given an interesting description of this tower, in his ingenious *Professional Observations on the Architecture of France and Italy* (pp. 62—65), assigns various reasons for concluding that the deviation from the vertical line is occasioned by want of care in laying the foundation of the tower. To the N. of the city are celebrated baths, constructed at the expense of the hospital of Pisa; and the revenues arising from them are appropriated to the hospital. This city was possessed and evacuated by the French republicans, in the same manner as that of Leghorn. It is seated in a fertile plain, at a small distance from the Mediterranean, 11 miles N.N.E. of Leghorn, and 42 W. by S. of Florence. Lon. 10, 23 E. Lat. 43. 43 N.

PISANO, a territory of Tuscany, lying W. of the Florentino, on the Mediterranean. It is 47 miles long and 25 broad; abounds in corn, oil, wine, and is well cultivated; but some of the necessities of life are dear. Pisa is the capital.

PISAN (Thomas), an astrologer of Bologna, who was invited to Venice by Dr. Forli, counsellor of the republic, who gave him his daughter in marriage. Charles V. of France sent him an invitation to come to his court, which he accepted in 1380. He is said to have pre-

dicted the day of his death, and to have fulfilled that prediction.

PISAN (Christina de), daughter of the above, born at Venice about 1363, was a beautiful woman and an accomplished writer. She wrote the *Life of Charles V.* which occasioned her to be patronized by Charles VI. of France.

PISCARY, in our ancient statutes, the liberty of fishing in another man's waters.

PISCATAQUA, a river of New Hampshire, the mouth of which forms the only port in that state, and at its entrance is a light-house in lon. 76. 41 W. Lat. 43. 4 N.

PISCATAWAY, a town of Maryland, in Prince George county, on a creek of its name, which flows W. into the Potomac, 14 miles S. of Washington.

PISCATION. *s.* (*piscatio*, Lat.) The act or practice of fishing (*Brown*).

PISFACTORY. *a.* (*piscatorius*, Lat.) Relating to fishes (*Addison*).

PISCES. Fishes. In zoology, the fourth class in the Linnéan system, thus classically characterised: jaws incumbent; penis (usually) none; eggs without albumen; possessing organs of sense and tongue; nostrils doubtful; possessing eyes and ears; covering, imbricate scales; supporters, fins; swim in the water, and smack. The class consists of six orders, for which see the articles **ICHTHYOLOGY** and **ZOOLOGY**.

PISCES, in astronomy, the twelfth sign or constellation of the zodiac. The stars in Pisces, in Ptolemy's catalogue, are thirty-eight; in Tycho's thirty-three; and in the Britannic catalogue one hundred and nine, viz. 0, 0, 3, 5, 24, 67, 10.

PISCIDIA. Jamaica dogwood. In botany, a genus of the class diadelphia, order decandria. Stigma acute; legume with four longitudinal wings. Four species, natives of America. The following is most worthy of notice.

P. erythrina. Dogwood-tree. Rises to the height of twenty feet, with a stem as large as a man's body; leaves unevenly pinnate, with ovate leaflets; flowers of a dirty white colour, succeeded by oblong pods which contain the seeds. The bark when pounded is made use of to intoxicate fishes, being first steeped for a night in salt water, when its juice is squeezed out, of a reddish hue, and put into the water in which the fishing takes place. The fishes becoming intoxicated rise to the surface of the stream, and float unconscious of their danger; the negroes attendant upon the fishing party are then sent into the water, who catch them with ease. It has never been found that, though this juice destroys many of the small fry, it produces mischief to those who eat any of the fishes caught by these means. This species of piscidia, and indeed one or two others, are occasionally cultivated in our own conservatories.

PISCIS AUSTRALIS, the southern fish, is a constellation in the southern hemisphere, being one of the forty-eight constellations

mentioned by the ancients. The star *toma-haut*, of the first magnitude, is in the mouth of this fish.

PISCIS VOLANS, the flying fish, in astronomy, is a small constellation of the southern hemisphere, unknown to the ancients, and invisible to us in these northern regions. It contains eight stars; viz. 0, 0, 0, 0, 7, 1.

PISCIVOROUS. *a. (piscis and voro, Lat.)* Fish-eating; living on fish (*Ray*).

PISCO, a town of Peru, in the audience of Lima, with a good road for ships. It is seated in a country fertile in excellent fruits and good wine, 140 miles S.S.E. of Lima. Lon. 76. 15 W. Lat. 13. 36 S.

PISELLO, the most northern cape of *Natolia*, which projects into the Black Sea, opposite the Crimea.

PISH. *interj.* A contemptuous exclamation.

To PISH. *v. n.* (from the interjection.) To express contempt (*Pope*).

PISIFORM BONE, in anatomy, the fourth bone of the first row of the carpus.

PISISTRATUS, an Athenian, who, after he had rendered himself the favourite of the populace by his liberality and his intrepidity, resolved to make himself master of his country. Every thing seemed favourable to his ambitious views; but Solon alone, who had lately enforced his celebrated laws, opposed him, and discovered his duplicity before the public assembly. Pisistratus not disheartened had then recourse to artifice. He cut himself in various places, and after he had exposed his mangled body to the eyes of the populace, deplored his misfortunes, and accused his enemies of attempts upon his life, because he was the friend of the people, he artfully obtained a chosen body of 50 men to defend his person from the malevolence of his enemies. Pisistratus had no sooner received the armed band than he seized the citadel of Athens, and made himself absolute. The people too late perceived their credulity, yet two of the citizens, Megacles and Lycurgus, conspired against him, and by their means he was forcibly ejected from the city. He, however, was shortly after re-established in his power by the assistance of Megacles, who grew jealous of Lycurgus. By means of a woman called *Phya*, whose features were noble and commanding, he imposed upon the people. *Phya* was conducted through the city, and was announced as *Minerva*, the patroness of Athens, who descended from heaven to re-establish her favourite Pisistratus, in a power sanctioned by the will of the Gods. This triumph was but of short duration, as some time after he fled from Athens to *Eubæa*, where he could no longer maintain his power. Eleven years after, he was, by means of his son *Hippias*, a third time received by the people of Athens as their sovereign. Upon this he sacrificed to his resentment the friends of *Megacles*, but he did not neglect the dignity and the honour of the Athenian name. He died about 527 years B. C. after he had enjoyed

the sovereign power at Athens for 33 years, including the years of his banishment, and he was succeeded by his son *Hipparchus*. *Pisistratus* claims our admiration for his justice, his liberality, and his moderation. It is to his labours that we are indebted for the preservation of the poems of *Homer*, and he was the first, according to *Cicero*, who introduced them at Athens, in the order in which they now stand. *Hipparchus* and *Hippias*, the sons of *Pisistratus*, who have received the name *Pisistratidæ*, rendered themselves as illustrious as their father, but the flames of liberty were too powerful to be extinguished; they were at length banished through the means of *Harmodius* and *Aristogiton*, who conspired against them, about 18 years after the death of *Pisistratus*, B. C. 510.

PISMIRE, in entomology. See **FORMICA**.

PISO, a celebrated family at Rome, descended from *Calpus*, the son of *Numa*. Before the death of *Augustus*, eleven of this family had obtained the consulship, and many had been honoured with triumphs, on account of their victories, in the different provinces of the Roman empire. Of this family, the most famous were, 1. *Lucius Calpurnius*, tribune of the people, about 149 years before Christ, and afterwards consul. His frugality procured him the surname of *Frugi*, and he gained the greatest honours as an orator, a lawyer, a statesman, and an historian. 2. *Caius*, a Roman consul, A.U.C. 685, who supported the consular dignity against the tumults of the tribunes, and the clamours of the people. 3. *Cneius*, another consul under *Augustus*, one of the favourites of *Tiberius*. He was accused of having poisoned *Germanicus*, and when he saw that he was shunned by his friends, he destroyed himself, A. D. 20. 4. *Lucius*, a governor of Spain, who was assassinated by a peasant, as he was travelling through the country. 5. *Lucius*, a governor of Rome for twenty years, an office which he discharged with the greatest justice and credit. He was greatly honoured by the friendship of *Augustus*. *Horace* dedicated his poem *De Arte Poetica* to his two sons, whose partiality for literature had distinguished them among the rest of the Romans. 6. *Cneius*, a factious and turbulent youth, who conspired against his country with *Catiline*. He was among the friends of *Julius Cæsar*. 7. *Caius*, a Roman who was at the head of a celebrated conspiracy against the emperor *Nero*. He had rendered himself a favourite of the people by his private as well as public virtues. When the plot was discovered by a freedman, one of the conspirators, he despaired taking any measures for his preservation. He retired to his own house, where he opened the veins of both his arms, and bled to death. 8. *Lucius*, a senator who followed the emperor *Valerian* into Persia. He proclaimed himself emperor after the death of *Valerian*, but he was defeated, and put to death a few weeks after; A. D. 261, by *Valens*,

&c. 9. Lucinianus, a senator adopted by the emperor Galba. He was put to death by Otho's orders.

PISOLITHUS, in mineralogy, a genus of the class earths, order calcareous. Consisting of carbonat of lime, a very small proportion of sand and oxyd of iron, carbonic acid gass, and water; soft, opaque, without lustre internally, breaking into indeterminate fragments, and separating into spherical granulations; of a centrally lamellar texture; found about warm springs. One species; *P. carolinus*. Pisolite. Oolite. Oolithic tufa. *Pisa carolina*. Compact limestone. Found near the warm springs of Carlsbad in Bohemia, in Silesia, and Hungary, in the form of round masses composed of concentric layers, each containing a grain of sand in its centre; colour white or yellowish-white, brownish, reddish, or yellowish.

PISONIA, in botany, so named in honour of William Piso, a physician, a genus of the polygamia dioecia class and order. Natural order of nictagines, Jussieu. Essential character: calyx scarcely any; corol bell-shaped; five-cleft; stamens five or six; pistil one; capsule superior, one-celled; valveless: male and female on the same or on different plants. There are five species.

To PISS. *v. a.* (*pisser*, Fr. *pisssen*, Dutch.) To make water (*L'Estrange*).

Piss. *s.* (from the verb.) Urine; animal water (*Pope*).

PISSABED. See **TARAXACUM** and **LEONDOTON**.

PISSASPALTUS. (*πισσαφαλτης*, from *πισσα*, pitch, and *αελης*, bitumen.) The thicker kind of rock oil.

PISTACHIA, in botany, a genus of the class dioecia, order pentandria. Male: an ament; calyx five-cleft; corolless. Female: flowers distinct; calyx three-cleft; corolless; styles two; drupe dry, one-seeded. Six species; natives of the south of Europe, Barbary, and Asia. The following are chiefly cultivated.

1. *P. vera*. Fistic nut-tree. *Pistachia nut-tree*. Leaves unequally pinnate; leaflets somewhat ovate, recurved, emitting an odour like that of the nut when bruised. Some of the trees produce male, others female flowers; and some, when old, have both on the same tree. The male flowers appear on the sides of the branches in loose bunches; the female flowers appear in the same manner in clusters. It is a native of Persia and India, and may be propagated by seeds or nuts procured from abroad, planted in pots filled with light earth, and plunged into a moderate hotbed. As the plant grows up it should be gradually hardened to bear the external air. The nut is about the size and shape of a filbert, and includes a kernel of a pale greenish colour covered with a yellow or greenish skin. These nuts have a sweetish unctuous taste, resembling that of sweet almonds; and like almonds, afford an oil which may be formed into an emulsion.

2. *P. terebinthus chio*, or *Cyprus turpentine tree*. Leaves unequally pinnate; leaflets seven, ovate-lanceolate: flowers from branching aments at the axils of the leaves. A native of Barbary and the south of Europe; flowering with us in June and July; and may be propagated as the last. It furnishes the chio or *Cyprus turpentine*, which is obtained by wounding the bark of the trunk in several places during the month of July, leaving a space of about three inches between the wounds; from these the turpentine is received on stones, and becomes so much condensed in the course of twenty-four hours, as to admit of being scraped off with a knife, which is always done in the morning before sun-rise. In order to purify it from extraneous matter it is again liquified by the sun's heat, and passed through a strainer; it is then fit for use.

3. *P. lentiscus*. Lentisk. Mastic-tree. Leaves abruptly pinnate; leaflets lanceolate: rises to the height of eighteen or twenty feet, the trunk covered with a grey bark. May be propagated by laying down the young branches, which, if properly managed, put out roots, in a year, and may then be cut off from the old tree, and planted in separate pots. Gum mastic is obtained from this tree, by making transverse incisions into its bark, from which the mastic exudes in a fluid state.

PISTE, in the manage, the tread or track that a horse makes upon the ground he goes over. The language is, "This horseman observes the piste, and makes it his business to follow the tread;" that is, he follows his ground regularly, without enlarging or narrowing, without traversing or entangling: "such a horse works well upon two treads;" he works well with one piste.

PISTIA, in botany, a genus of the class monodelphia, order octandria. Calyx a tubular-hooded, tongue-shaped spathe: corolless; filament lateral; anthers from three to eight; style one; capsule one-celled, many-seeded. One species only; a native of Asia, Africa, America, and the West Indies; a stemless floating aquatic, with white axillary flowers.

PISTIL. The pointal of a plant. *Viscus fructui adhærens, pro pollinis receptione*. Philos. Bot. *Viscus interior e medulla. Organum genitale femineum*. Regn. Veg. A viscus or organ adhering to the fruit for the reception of the pollen. It is the fourth part of the fructification; and is supposed by Linnæus to be a continuation of the medulla or pith. Its appearance is that of a column or set of columns in the centre of the flower: and, when perfect, it consists of three parts. 1. Germen; the germ or ovary. 2. Stylus; the style. 3. Stigma.

PISTILLATION. *s.* (*pistillum*, Latin.) The act of pounding in a mortar (*Brown*).

PISTILLIFEROUS FLOWER. Having a pistil without stamens. Called a female flower by Linnæus.

PISTOIA, a considerable town of Tuscany, with a bishop's see. There are several fine

churches and magnificent palaces; but it is almost deserted in comparison to what it was formerly. It is seated at the foot of the Apennines, near the river Stella, 20 miles N.W. of Florence. Lon. 11. 29 E. Lat. 43. 55 N.

PISTOL. *s.* (*pistole, pistolet*, French.) A small hand-gun (*Clarendon*).

To PISTOL. *v. a.* (*pistoler*, French.) To shoot with a pistol.

PISTO'LE. *s.* (*pistole*, French.) A gold coin of many countries and many degrees of value.

PISTOLET. *s.* (diminutive of *pistol*.) A little pistol (*Donne*).

PISTON (*embolus*), in pump work, is a short cylinder of metal, or other solid substance, fitted exactly to the cavity of the barrel or body of the pump. There are two kinds of pistons used in pumps, the one with a valve, and the other without a valve, called a forcer; and each of these admits of a great variety.

PISUM. Pea. In botany, a genus of the class diadelphia, order decandria. Style triangular, carinate, with a sharp edge and downy on the upper side: two upper segments of the calyx shorter. Four species; all European plants, one indigenous to our own coasts.

1. *P. sativum*. Common pea. Petioles cylindrical; stipules rounded and crenate at bottom; peduncles many-flowered. There are four other varieties:

♂ Common marrowfat.

γ With the peas green.

δ With the husk eatable.

ζ With the flowers in umbels.

The subvarieties are almost innumerable, and it is impossible to allow space enough even to catalogue them. We shall therefore divide the more valuable of them into two sections of early and late.

Early Kinds.

Early golden hotspur.

Early Charlton hotspur.

Nichols's early golden hotspur.

Early Charlton.

Reading hotspur.

Masters's hotspur.

Ormsod's hotspur.

Early dwarf hotspur.

Leadman's dwarf.

Fan Spanish dwarf.

Early dwarf frame pea.

Pearl pea.

Cluster pea.

Royal green pea.

Essex hotspur.

Dwarf pea.

Sugar pea.

Late Kinds.

Spanish morotto.

Nonpareil.

Sugar dwarf.

Sickle pea.

Marrowfat.

Dwarf marrowfat.

Rose or crown pea.

Rounceval pea.

Long bearing pea.

Green field-pea.

White field-pea.

Pig pea.

As it is now the fashion to have peas very early, several of the former section are raised on hot-beds. The method of doing this is to sow the peas under warm hedges or walls, about the middle of October. When the plants are come up, their stalks are to be kept earthed up, and thus they are to remain till the beginning of February, covering them against the severe frost with pease-haulm, or other light covering. In January or February a moderate hot-bed must be made: the dung should be laid about two feet thick and carefully beat down, and covered about six inches deep with light fresh earth; and when the frames have been set on about four days the plants must be planted in the earth, at about a foot distance in rows, and placed in each row, at about two inches one from another. They must be watered and shaded till they have taken root, and then they must have as much air as possible; and when they begin to fruit, they must be watered more frequently than before, which will occasion their producing a larger quantity of fruit. The common dwarf pea is the sort always used on this occasion, as all the rest ramble too much in their stalks. The first sort of pea which should be sown to succeed those on the hot-beds is the hotspur, of which the gardeners reckon three or four subvarieties, which differ very little from each other; but that called the golden hotspur is usually preferred to the rest. These should be sown on warm borders in October, as those intended for the hot-bed, and treated every way in the same manner: but in spring these are subject to be destroyed by slugs and other vermin; the best method of destroying which is to slake a little lime, and throw over the earth among the plants. For fear of this crop miscarrying by the severity of weather, it is always proper to sow two others after this, at the distance of a fortnight each; and after this there should be no others sowed till the end of January; and after these there should be others at the beginning and end of February. To succeed these, which will supply the table with early pease, the Spanish morotto, which is a large pea, and a very plentiful bearer, should be sowed in rows on a clear plat of ground; the rows should be two feet and a half distant, and the pease dropt at an inch or two asunder: these must be all very carefully covered two inches deep with earth, and the rooks, mice, &c. prevented from getting at them. A fortnight after this, another spot should be sowed with this or some other large pea, and this continue every fortnight till the beginning of June.

The common white-pea succeeds best in a light land, somewhat rich: the time of sowing them is in the middle of April. Three bushels are the common allowance for an acre; and they kill the weeds a land is subject to, better

than any other crop. In Staffordshire they sow the garden rouncevals in fields, and they grow and yield very well, though they are left trailing upon the ground without any support of sticks. The white and rounceval pea are only to be sown with a broad cast, and harrowed in; but the common grey-pea, which is more frequently sown in fields than either of them, must be sown under furrow, and delights most in a cold wet clay; these are to be sown in February; and the common quantity of seed is two bushels to an acre. The blue pea is the best kind for light sandy land, and should be sown early. All peas love land manured with lime or marle, and should therefore be indulged in this propensity.

2. *P. arvense*. Petioles four-leaved; stipules crenate; peduncles one-flowered. This like the last is a native of Europe, and often cultivated, though less frequently for general use.

3. *P. maritimum*. English sea pea. Petioles flattish on the upper side; stem angular; stipule arrow-shaped; peduncles many-flowered. It is found wild upon the coast of Sussex, and in several other maritime counties; nearly allied to lathyrus.

4. *P. ochrus*. Yellow-flowered pea. Petioles decurrent, membranaceous, two-leaved; peduncles one-flowered. A native of Crete and Italy. The flowers are pale yellow, and small; pods two inches long: the peas may be eaten green, but unless gathered when very young they are coarse, and never so good as the common pea.

All these may be sown and managed as the common or garden pea.

PIT. *s.* (pic, Saxon; *pix*, Latin.) 1. A hole in the ground (*Bacon*). 2. Abyss; profundity (*Milton*). 3. The grave (*Psalms*). 4. The area on which cocks fight (*Hudibras*). 5. The middle part of the theatre (*Dryden*). 6. Any hollow of the body: as, *the pit of the stomach*; *the arm-pit*. 7. A dint made by the finger. 8. A mark made by a disease.

To PIT. *v. a.* 1. To press into hollows (*Sharp*). 2. To mark with hollows, as by the smallpox.

PITAPAT. *s.* (*patte, patte*, French.) 1. A flutter; a palpitation (*L'Estrange*). 2. A light quick step (*Dryden*).

PITCAIRNE (Archibald), an eminent physician, born at Edinburgh, 1652. After studying divinity and civil law, he chose physic and mathematics as his profession. He was for some time at Paris, and on his return excited the public attention by a small publication, in which he disputed the right of Harvey to the discovery of the circulation of the blood, which he asserted was fully known to Hippocrates. In 1692 he accepted the chair of professor of medicine at Leyden; but the next year returned to Scotland. He acquired here greater reputation by his pen than by his profession. His *dissertationes medicæ* appeared 1701, and were again edited 1713. He wrote besides some obscure Latin satirical poems, chiefly levelled against the friends of the revolution, which he by no means approved. He died 1713.

PITCAIRNIA, in botany, a genus of the

class hexandria, order monogynia. Calyx three-leaved, half superior; petals three with a nectariferous scale at the base of each: stigmas three, twisted; capsules three, bursting inwards; seeds winged. Three species; herbaceous plants of Jamaica, Santa Cruz, or India.

PITCAITLY WELLS, some remarkable saline springs, near Perth, in Scotland, deemed beneficial in scorbutic cases.

PITCH. *s.* (pic, Saxon; *pix*, Latin.) 1. The resin of the pine extracted by fire and inspissated (*Proverbs*). 2. (from *pic*, French. *Skinner*.) Any degree of elevation or height (*Shakspeare*). 3. Highest rise: not used (*Shakspeare*). 4. State with respect to lowness or height. 5. Size; stature (*Spenser*). 6. Degree; rate (*Denham*).

To PITCH. *v. a.* (*appicciare*, Italian.) 1. To fix; to plant (*Dryden*). 2. To order regularly (*Hooker*). 3. To throw headlong; to cast forward (*Shakspeare*). 4. To smear with pitch (*pico*, Latin. *Dryden*). 5. To darken (*Shakspeare*). 6. To pave (*Ainsworth*).

To PITCH. *v. n.* 1. To light; to drop (*Mortimer*). 2. To fall headlong (*Dryden*). 3. To fix choice (*Hudibras*). 4. To fix a tent or temporary habitation.

PITCH, in music, the acuteness or gravity of any particular sound, or of the tuning of any instrument. Any sound less acute than some other sound is said to be of a lower pitch than that other sound, and *vice versa*. The opera pitch is tuned above most others, and is therefore said to be higher than the common concert pitch.

PITCH. (*pix*.) *Pix sicca*. The juice of a species of fir, extracted by incision made in the bark of the tree. It is sometimes used as a detergent by surgeons. See PINUS.

PITCH (Burgundy). See BURGUNDY PITCH.

PITCH (Fossil). See PETROLEUM.

PITCH (Jews). See BITUMEN JUDAICUM.

PITCH TREE, in botany. See PINUS, in botany.

PITCHSTONE, in mineralogy, a species of opal. See OPALUS.

PITCHER. *s.* (*pitcher*, French.) 1. An earthen vessel; a water pot (*Shakspeare*). 2. An instrument to pierce the ground in which any thing is to be fixed (*Mortimer*).

PITCHER-SHAPED. *Urceolatus*. Swelling or bellying out like a pitcher. Applied to the calyx, corolla, and nectary.

PITCHFORK. *s.* (*pitch* and *fork*.) A fork with which corn is pitched or thrown upon the waggon (*Swift*).

PITCHINESS. *s.* (from *pitchy*.) Blackness; darkness.

PITCHING, in naval affairs, is the vertical vibration which the length of a ship makes about her centre of gravity, or the motion by which she plunges her head and after part alternately into the hollow of the sea. This motion may proceed from the waves that agitate the vessel, or the wind acting upon the sails, which makes her stoop at every blast.

PITCH-PIPE, in music, an instrument

used by vocal practitioners to ascertain the pitch of the key in which they are about to sing. It is blown at one end, like a common flute, and being shortened or lengthened by a graduated scale, is capable of producing with mechanical exactness all the semitonic degrees within its compass.

PITCHY. *a.* (from *pitch*.) 1. Smeared with pitch. (*Dryden*). 2. Having the qualities of pitch. (*Woodward*). 3. Black; dark; dismal. (*Prior*).

PITCOAL. *s.* (*pit* and *coal*.) See **COAL** and **COLLIERY**.

PITEOUS. *a.* (from *pity*.) 1. Sorrowful; mournful; exciting pity. (*Shakspeare*). 2. Compassionate; tender. (*Prior*). 3. Wretched; paltry; pitiful. (*Milton*).

PITEOUSLY. *ad.* (from *piteous*.) In a piteous manner. (*Shakspeare*).

PITEOUSNESS. *s.* (from *piteous*.) Sorrowfulness; tenderness.

PITFALL. *s.* (*pit* and *fall*.) A pit dug and covered, into which a passenger falls unexpectedly. (*Sandys*).

PITH. *s.* (*pitte*, Dutch.) 1. The marrow of the plant; the soft part in the midst of the wood. (*Bacon*). 2. Marrow. See **MARROW** and **MEDULLA**. 3. Strength; force. (*Shaks.*). 4. Energy; cogency; fulness of sentiment; closeness and vigour of thought and style. 5. Weight; moment; principal part. (*Shakspeare*). 6. The quintessence; the chief part. (*Shaks.*).

PITHEA, a seaport of Sweden, in W. Bothnia, seated on a small island, at the mouth of the Pithea, in the gulf of Bothnia. It is joined to the continent by a wooden bridge, and is 80 miles S.W. of Tornea. Lon. 22. 40 E. Lat. 65. 11 N.

PITHECUSA, a small island on the coast of Etruria, anciently called *Ænaria* and *Inarina*, with a town of the same name on the top of a mountain. Some suppose that it received its name from *πῑθηκοί*, monkeys, into which the inhabitants were changed by Jupiter.

PITHILY. *ad.* (from *pithy*.) With strength; with cogency; with force.

PITHINESS. *s.* (from *pithy*.) Energy; strength. (*Spenser*).

PITHESS. *a.* (from *pith*.) 1. Wanting pith; wanting strength. (*Shakspeare*). 2. Wanting energy; wanting force.

PITHO, the goddess of persuasion among the Romans, supposed to be the daughter of Mercury and Venus.—2. A Roman courtesan, who received this name on account of the allurements which her charms possessed, and of her winning expressions.

PITHOU (Peter), a Frenchman, born at Troyes, 1539. He studied under Turnebus and Cujacius, and became distinguished at the bar as an eloquent civilian. He escaped with difficulty the slaughter of St. Bartholomew, and immediately embraced the Romish faith. He visited England with Montmorency, and so great was his character that the duke of Tuscany referred some intricate points to his impartial decision, and the third and fourth Henries employed his abilities, not only to

oppose the league, but to support the Gallican church against the Roman pontiff. Pithou died on his birth-day, 1596. He published some valuable works on law, history, and classical literature, and to his industry we are indebted for the discovery of Phædrus, of the novella of Justinian, and other books buried in obscurity. The best known of his works are treatise on the liberties of the Gallican church, 4 vols. fol.—Notes on authors, &c.

PITHOU (Francis), brother of Peter, was procureur general of the chamber of justice under Henry IV. against the financiers, and afterwards was admitted into the king's council. He discovered the fables of Phædrus, which he published with his brother. He published of his own a comparison of the law of the Romans with those of Moses, 12mo.—an edition of the Salique law with notes—treatise on the greatness and the rights of the French monarchy, 8vo.—an edition of comes theologus—observations ad codicem, fol.—antiqui rhetores Latini Rutulius Lupus, Aquila Romanus, &c. He died 1621.

PITHY. *a.* (from *pith*.) 1. Consisting of pith. (*Philips*). 2. Strong; forcible; energetic. (*Addison*).

PITIABLE. *a.* (*pitoyable*, Fr. from *pity*.) Deserving pity. (*Atterbury*).

PITIABLENESS. *s.* (from *pitiable*.) State of deserving pity. (*Kettlewell*).

PITIFUL. *a.* (*pity* and *full*.) 1. Melancholy; moving compassion. (*Spenser*). 2. Tender; compassionate. (*Shakspeare*). 3. Paltry; contemptible; despicable. (*Dryden*).

PITIFULLY. *ad.* (from *pitiful*.) 1. With pity; with compassion. (*Com. Pr.*). 2. Mournfully; in a manner that moves compassion. (*Tillotson*). 3. Contemptibly; despicably. (*Clarrissa*).

PITIFULNESS. *s.* (from *pitiful*.) 1. Tenderness; mercy; compassion. (*Sidney*). 2. Despicableness; contemptibleness.

PITILESSLY. *ad.* (from *pitiless*.) Without mercy.

PITILESSNESS. *s.* Unmercifulness.

PITILESS. *a.* (from *pity*.) Wanting pity; wanting compassion; merciless. (*Fairfax*).

PITISCUS (Samuel), of Zutphen, 1637, studied at Deventer and Groningen, and was elected master of the school at Zutphen, and afterwards obtained the direction of the college of Jerome at Utrecht, where he died 1717. He was author of several learned works, lexicon Latino Belgicum, 4to.—lexicon antiquitatum Romanarum, fol.—besides an edition of Rufinus' Rom. antiquities—editions of Suetonius, Q. Curtius, Aurelius Victor, &c.

PITISCUS (Bartholomew), author of thesaurus mathematicus, fol. and of a treatise on trigonometry, died 1613.

PITMAN. *s.* (*pit* and *man*.) He that in sawing timber works below in the pit. (*Moxon*).

PITOT (Henry), of a noble family in Languedoc, was born at Aramont in the diocese of Uzés, on the 29th of May 1695, and died there on the 27th of December, 1771, aged 76. He learned the mathematics without a master, and

went to Paris in 1718, where he formed a close friendship with the illustrious Reaumur. In 1724, he was admitted a member of the Royal Academy of Sciences at Paris, and in a few years rose to the degree of a pensioner. Besides a vast number of memoirs printed in the collection of that society, he published in 1731 the *Theory of the Working of Ships*, in one volume 4to; a work of considerable merit, which was translated into English, and made the author be admitted into the Royal Society of London. In 1740, the states-general of Languedoc made choice of him for their chief engineer, and gave him at the same time the appointment of inspector-general of the canal which unites the two seas. That province is indebted to him for several monuments of his genius, which will transmit his name with lustre to posterity. The city of Montpellier being in want of water, Pitot brought from the distance of three leagues two springs which furnish a plentiful supply of that necessary article. They are brought to the magnificent Place du Peyron, and thence are distributed through the city. This astonishing work is the admiration of all strangers. The illustrious Marshal de Saxe was the great patron and friend of Pitot, who had taught this hero the mathematics. In 1754, he was honoured with the order of St. Michael. In 1735 he married Maria-Leonina Pharambier de Sabballoua, descended from a very ancient noble family of Navarre. By this marriage he had only one son, who was first advocate-general of the court of accounts, aids, and finances of Montpellier. Pitot was a practical philosopher, and a man of uncommon probity and candour. He was also a member of the Royal Society of Sciences of Montpellier; and his eulogium was pronounced in 1772, by M. de Ratte, perpetual secretary, in presence of the states of Languedoc; as it likewise was at the Royal Academy of Sciences at Paris, by Abbé de Fouchi, who was then secretary.

PITS or PITSEUS (John), an English biographer, born at Alton, 1560, and educated at Winchester and New college, Oxford. He went to Douay, Rheims, and to Rome, where he studied seven years, and became a priest. By the patronage of cardinal Lorraine he obtained a canonry at Verdun, and afterwards was confessor to the duchess of Cleves for twelve years. He next was made dean of Verdun, where he died 1616. He wrote an useful work collected from English history, containing the lives of the kings, bishops, apostolical men, and writers of England, in 4 large vols. but of these only part was published under the title of *de illustribus Angliæ scriptoribus*, &c.

PITSAW. *s.* (*pit* and *saw*.) The large saw used by two men, of whom one is in the pit (*Moxon*).

PITT (Christopher), an English poet, born at Blandford, 1699, and educated at Winchester school. When chosen to college he presented to his electors a poetical translation of Lucan's *Pharsalia*, which unfortunately is not

now extant. In 1722 he obtained the living of Pimpurn, Dorsetshire, and closed a life of benevolence and virtue, 1748, and was buried at Blandford, where a stone records the candor and simplicity of his manners, and asserts that he lived innocent and died beloved. He is chiefly known as the author of an eloquent translation of the *Æneid*, which rivals Dryden's, but of which it may be said, that while Pitt pleases the critic, Dryden charms the people, and that Pitt is quoted while Dryden is read. He also translated Vida's art of poetry, and wrote some poems, &c.

PITT (William), earl of Chatham, an illustrious statesman, born 15th Nov. 1708. His grandfather was the governor of Madras, who purchased for 20,400l. a celebrated diamond, weighing 127 carats, which received the name of Regent, because sold to the regent of France for 135,000l. The young statesman was educated at Eton, and in 1726 he entered at Trinity college, Oxford, which he left for the military profession. In 1735 he was elected into parliament for Old Sarum, and enlisted early in the ranks of opposition against Walpole; and in his speeches against the Spanish convention, and against the bill for registering seamen, displayed such acuteness, vehemence, and depth of argumentation, as astonished the house, and marked him as worthy of the highest offices of the state. The duchess of Marlborough, applauding the patriotism of the young orator, left him in her will a legacy of 10,000l. for defending, as she said, the laws of his country. In 1746, in the administration which had succeeded Walpole, he became joint vice-treasurer of Ireland, and soon after treasurer and paymaster of the army, and privy counsellor. In 1755 he resigned; but though the next year he received the seals of secretary of state, he did not continue long in office; but the public voice accompanied him in his retirement, and in June, 1757, he was reinstated in his office. His restoration to power was a new era of splendid conquests, and of national glory. England proved every where successful in consequence of his judicious plans. Quebec was conquered, and the French were defeated in Africa and in the East. The death of George II. and the accession of George III. was soon followed by the resignation of the minister, who refused to co-operate with an administration, which by the influence of lord Bute, as it is supposed, thwarted his vigorous measures. His retirement was attended by the grant of a peerage to his lady, and a pension of 3000l. His censured the peace of 1763, declaring that England from the extent of her victories was entitled to more solid advantages. He afterwards remained silent till the question of general warrants, in 1764, called forth all his eloquence, and the keenness of his satire against those unpopular engines of arbitrary power. In 1766 he accepted the privy seal, and an earldom; but he resigned the office, Nov. 1768. His health now declined, and a hereditary gout undermined his constitution, without,

however, diminishing the energetic powers of his mind. In the American war he burst forth from his retirement, and, in the house of lords, deprecated severe measures against the colonists. On one of these occasions, after the duke of Richmond had replied to him, the venerable peer rose up to answer the speech, but his debilitated constitution sunk under the attempt, and he fell in a fit into the arms of those who were near him. This event, which exhibited a favourite statesman breathing his last, whilst he uttered the most animated sentiments for the glory and the independence of his country, happened 8th of April, 1778, and he died on the ensuing 11th of May. All parties now united to pay due respect to his memory. A public funeral and a monument in Westminster abbey, at the expence of the nation, were immediately voted by parliament, as a testimony, as the inscription records, to the virtues and abilities of a man, during whose administration divine providence had exalted Great Britain to a height of prosperity and glory unknown to any former age. As a statesman, says his biographer, lord Chatham was born with all the graces of the orator, and possessed every requisite to bespeak respect and even awe. A manly figure and penetrating look fixed attention and commanded reverence, and the keen lightening of his eye spoke the high spirit of his soul, even before the lips had begun utterance. The most fluent and ready orators have shrunk back appalled from his all-powerful eloquence. He had not indeed the correctness of language so striking in the great Roman orator, but he had the *verba ardentia*, the bold, glowing words, which darted with such irresistible efficacy, that Walpole, surrounded with power and the unshaken support of a decided majority, never heard his voice in the house of commons without being alarmed and thunder-struck. Letters from lord Chatham to his nephew were published a few years ago by lord Grenville.

PITT (William), a celebrated statesman, second son of the preceding, was born at Hayes, 28th May, 1759. From his earliest years he was instructed by his father, who foresaw his future greatness, and taught him to argue with logical precision, and to speak with elegance and force. Under the tuition of the Rev. Mr. Wilson, and at Pembroke hall, Cambridge, under Dr. Turner, and Dr. Pretzman, he matured his knowledge of classical literature, and of mathematics, and he left the university with the degree of M. A. and a high character for application and for abilities. He then entered at Lincoln's-inn, and went once or twice on the western circuit, where he was occasionally employed as junior counsel. At the first general election he was proposed for Cambridge university, but few seconded his pretensions; and the next year he obtained a seat for Appleby. He enlisted against lord North and the American war; and his first speech in support of Mr. Burke's bill displayed that commanding eloquence

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which many of the members had before so warmly applauded in his father. His first motion was for the more equal representation of the people in parliament; and though it was lost by a small majority, it rendered him a popular member in the commons. On the death of lord Rockingham, he accepted, at the age of 22, the office of chancellor of the exchequer; and under this administration the American war was concluded. Though he ably defended his colleagues, the peace was regarded by the majority of the nation as unpopular, and the ministry was dissolved. Restored to privacy, Mr. Pitt passed some months on the continent; and on the dismissal of the coalition administration, he was selected for the office of first lord of the treasury, and chancellor of the exchequer, 18th December, 1783. Thus, at the head of affairs, he bent the great powers of his mind to the framing of a bill for the regulation of India affairs, less objectionable than that of Mr. Fox. His attempts were at first unavailing, as his predecessors retained their influence in the commons; and in consequence of this struggle between the house and the king's prerogative, an appeal was made to a new parliament. The new parliament not only approved of his India bill, but adopted his system for the reduction of the national debt by a sinking fund, and cemented his commercial treaty with France. During the king's unfortunate illness, in 1788, Mr. Pitt boldly resisted the right of the prince of Wales to assume the government, which Mr. Fox, with more warmth than constitutional knowledge, had hastily asserted. The murder of the French king, and the ambitious views of the rulers of France, were productive of disputes with England, and war was declared in 1793. During hostilities for eight years, in situations where all precedents were unavailing, and all the political principles of former times disregarded, the premier conducted the affairs of the nation with that manly energy which future historians will celebrate to his honour. He planned, in 1800, the union with Ireland. He soon after retired from the head of affairs, in consequence of disputes with respect to the catholic emancipation; but more probably to make room for an administration which might, with greater probability of success, negotiate a peace with France. The insidious peace of Amiens, under the administration of Mr. Addington, met with the approbation of Mr. Pitt, as the most advantageous which the situation of the continent, and the gigantic power of France could allow, and in 1804 he was again replaced at the head of affairs. Difficulties, however, surrounded him on all sides; many of his old colleagues had joined the ranks of opposition, and not a few condemned the method by which he had regained his ascendancy in the king's councils. Unappalled by the dangers which threatened his country, he formed that powerful confederacy with Russia and Austria, which, had it been better conducted by the generals of the belligerent powers, might have checked, if not crushed,

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the colossal influence of France. In the mean time, while public affairs assumed the most threatening aspect, a hereditary gout weakened the delicate constitution of the minister, and the seeds of the illness under which he laboured in 1802, and which had never been completely eradicated, produced the most alarming debility in the nervous system. Excessive anxiety, application to business, and besides, a constant privation of rest, contributed to the general breaking up of his constitution, and the intelligence of the disasters at Austerlitz, and the failure of his favourite plan for the deliverance of Europe from French tyranny, hastened his end. He expired at his house at Putney, Surrey, on the 23d January, 1806, and the last words which quivered on the dying lips of this extraordinary man were, Oh, my country! By a vote of the commons, his remains were buried in Westminster abbey, at the public expence, and the heart of every lover of patriotism assents to the truth of the emphatical words which the herald pronounced after the corpse had descended to the tomb; *non sibi sed patriæ vivit*. By the same vote of the commons, his debts were discharged by the public; and it is not a small proof of his great disinterestedness, that, during a long administration of above 20 years, he not only did not accumulate riches, but died insolvent. To appreciate the character of Mr. Pitt is no easy task. We shall adopt part of an account (which in the main we believe to be very just) of Mr. John Gifford; and for a more enlarged view of Mr. Pitt's varied talents, refer to the account of Mr. Gifford's book in No. 7. of the Quarterly Review.

As a statesman, the resources, as well as the firmness, of Mr. Pitt's mind have been amply demonstrated by the measures which he adopted, to meet the various and unforeseen difficulties with which this nation was surrounded, during the period of his administration. Abroad, he had to struggle with the most gigantic power which ever raised its head in opposition to his country; while at home, he had to support at the same time commercial and national credit, to allay the spirit of mutiny, to extinguish the flames of rebellion, to provide for the importunate calls of famine. The energies of his mind were most eminently exerted upon those important occasions; so that, in spite of internal distractions, he carried the power of the nation to a greater height than it had attained even under the administration of his father.

As a parliamentary orator, his powers were various. In statement he was perspicuous, in declamation animated. If he had to explain a financial account, he was clear and accurate. If he wanted to rouse a just indignation for the wrongs of the country, he was rapid, vehement, glowing, and impassioned. And whether his discourse was argumentative or declamatory, it always displayed a happy choice of expression, and a fluency of diction, which could not fail to delight his hearers. So singularly select, felicitous, and appropriate was his language, that

it has often been remarked, a word of his speech could scarcely be changed without prejudice to its harmony, vigour, or effect. He admired much in Mr. Fox, the happy effect with which he illustrated his arguments, by the application of well-known anecdotes, or by passages from modern authors; but he did not imitate him in this respect: on the other hand, he used to condemn his habit of repetition.

Mr. Pitt's love of amplification has been sometimes urged as detracting from his excellence as an orator; but it was his own remark, that every person who addressed a public assembly, and was anxious to be distinctly understood, and to make an impression upon particular points, must either be copious upon those points, or repeat them, and that, as a speaker, he preferred copiousness to repetition. Of his eloquence, it may be observed generally, that it combined the eloquence of Tully with the energy of Demosthenes. It was spontaneous; always great, it shone with peculiar, with unequalled splendour, in a reply, which precluded the possibility of previous study; while it fastened the imagination by the brilliancy of language, it convinced the judgment by the force of argument; like an impetuous torrent, it bore down all resistance: extorting the admiration even of those who most severely felt its strength, and who most earnestly deprecated its effect.

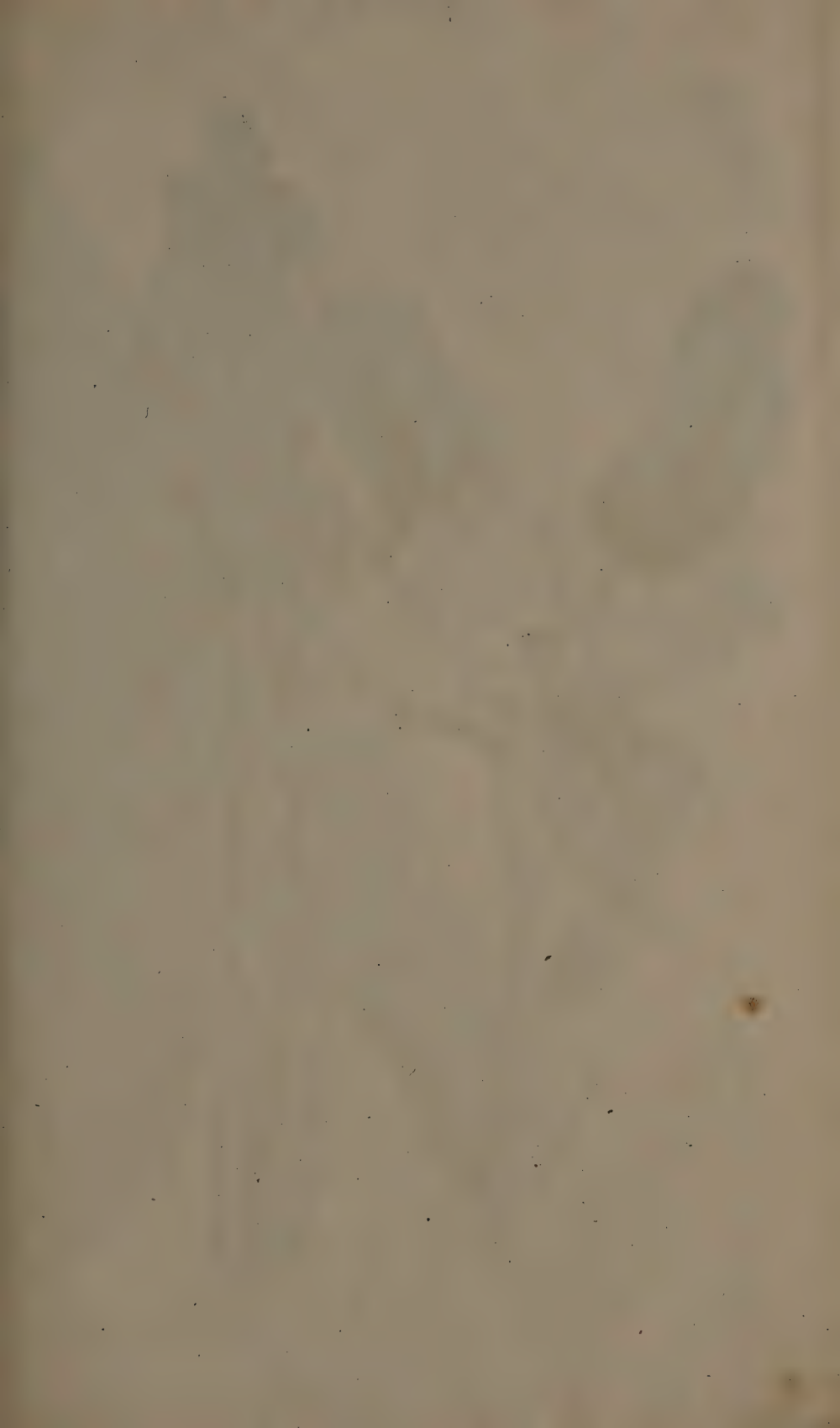
PITTACUS, a native of Mitylene in Lesbos, was one of the seven wise men of Greece. His father's name was Hyrradius. He delivered his country from the oppression of the tyrant Melanchrus, and in the war which the Athenians waged against Lesbos, he killed Phrynon, the enemy's general, by entangling him in a net. He was amply rewarded for this victory; his countrymen unanimously appointed him governor of their city with unlimited authority. In this capacity, Pittacus behaved with great moderation, and after he had established and enforced the most salutary laws, he voluntarily resigned the sovereign power, after he had enjoyed it for ten years, observing, that the virtues and innocence of private life were incompatible with the power and influence of a sovereign. He died in the 82d year of his age, about 570 years before Christ, after he had spent the last ten years of his life in literary ease and peaceful retirement. Many of his maxims were inscribed on the walls of Apollo's temple at Delphi. By one of his laws, every fault committed by a man when intoxicated deserved double punishment.

PITTANCE. *s.* (*pitance*, Fr. *pietantia*, Ital.) 1. An allowance of meat in a monastery. 2. A small portion (*Shakspeare*).

PITTED LEAF. See LACUNOSUS.

PITTENWEEM, a seaport in Fifeshire, at the entrance of the frith of Forth, 23 miles N.E. of Edinburgh. Lon. 2. 49 W. Lat. 56. 12 N.

PITTHRUS, a king of Trœzene in Argolis, son of Pelops and Hippodamia, universally admired for his learning and wisdom. He gave his daughter Æthia in marriage to Ægeus, king



*Pontederia Cordata.**Heart-leaved Pontederia.**Pittosporum Tobira.**Glossy-leaved Pittosporum.*

of Athens, and he himself took particular care of the education of his grandson Theseus. He was buried at Trœzene, and on his tomb was seen, for many ages, three seats of white marble, on which he sat with two other judges, whenever he gave laws to his subjects.

PITTOSPORUM, in botany, a genus of the class pentandria, order monogynia. Calyx deciduous; petals five, forming a tube; capsule from two to five-valved; seeds covered with a pulp. There is but one species that really belongs to this genus, though several are by some botanists erroneously ranked under it: *P. coriaceum*; a tree of the Canaries with oblong blunt leaves; peduncles solitary, many-flowered; flowers on umbelled pedicels. See Nat. Hist. Pl. CXL.

PITTSBURGH, or **FORT PITT**, a flourishing town of Pennsylvania, capital of the county of Allegany, situated on the W. side of the Allegany mountains, on a point of land between the rivers Allegany and Monongahela. Here was the French fort du Quesne; in an expedition against which, in 1756, general Braddock fell into an ambuscade, and was defeated and slain. This fort was abandoned by the French, in 1758, on the approach of general Forbes; and its name was changed to that of Pitt, in honour to the minister by whom the war was then directed. At this place the Allegany takes the name of Ohio. It is 320 miles W. of Philadelphia. Lon. 79. 48 W. Lat. 40. 26 N.

PITUITA. (*pituita*.) Phlegm, or viscid and glutinous mucus.

PITUITARY GLAND. *Glandula pituitaria*. In anatomy, a gland situated within the cranium, between a duplicature of the dura mater, in the sella turcica of the sphenoid bone.

PITUITARY MEMBRANE. *Membrana pituitaria*. In anatomy. Schneiderian membrane. The mucus membrane that lines the nostrils and sinuses, communicating with the nose, is so called, because it secretes the mucus of those parts, to which the ancients have assigned the name of pituita.

PITUITOUS. *a. (pituitosus*, Latin; *pituiteux*, French.) Consisting of phlegm (*Arbuthnot*).

PITY. *s. (pitie*, Fr. *pieta*, Italian.) 1. Compassion; sympathy with misery; tenderness for pain or uneasiness (*Calamy*). 2. A ground of pity; a subject of pity or of grief (*Bacon*).

To PITY. *v. a. (pitoyer*, French.) To compassionate misery; to regard with tenderness on account of unhappiness (*Addison*).

To PITY. *v. n.* To be compassionate (*Jerem.*).

PITYOCAMPASIS. See **BOMBYX**.

PITYRIASIS. (*πυτυρίασις*, from *πυτυρον*, bran, so named from its branny like appearance.) A genus in the second order, or scaly diseases, of Dr. Willan's cutaneous diseases. The pityriasis consists of irregular patches of small thin scales, which repeatedly form and separate, but never collect into crusts, nor are attended with redness or inflammation, as in

the lepra and scaly tetter. Dr. Willan distinguishes pityriasis from the porrigo of the Latins, which has a more extensive signification, and comprehends a disease of the scalp, terminating in ulceration; whereas the former is, by the best Greek authors, represented as always dry and scaly. Thus, according to Alexander and Paulus, pityriasis is characterised by "the separation of slight furfuraceous substances, from the surface of the head, or other parts of the body, without ulceration." Their account of this appearance is conformable to experience; and the two varieties of it which they have pointed out may be denominated pityriasis capitis, and pityriasis versicolor. Pityriasis capitis, when it affects very young infants, is termed by nurses the dandriff. It appears at the upper edge of the forehead and temples, as a slight whitish scurf set in the form of a horse-shoe; on other parts of the head there are large scales, at a distance from each other, flat, and semipellucid. Sometimes, however, they nearly cover the whole of the hairy scalp, being close together, and imbricated. A similar appearance may take place in adults; but it is usually the effects of lepra, scaly tetter, or some general disease of the skin.

Elderly persons have the pityriasis capitis in nearly the same form as infants; the only difference is, that this complaint in old people occasions larger exfoliations of the cuticle.

The pityriasis versicolor chiefly affects the arms, breasts, and abdomen. It is diffused very irregularly; and being of a different colour from the usual skin colour, it exhibits a singular chequered appearance. These irregular patches, which are at first small, and of a brown or yellow hue, appear at the scrobiculus cordis, about the mammæ, clavicles, &c. Enlarging gradually, they assume a tessellated form; in other cases they are branched, so as to resemble the foliaceous lichens growing on the bark of trees; and sometimes, when the discolouration is not continuous, they suggest the idea of a map being distributed on the skin like islands, continents, peninsulas, &c. All the discoloured parts are slightly rough, with minute scales, which soon fall off, but are constantly replaced by other. This scurf, or scalliness, is most conspicuous on the sides and epigastric region. The cuticular lines are somewhat deeper in the patches than on the other contiguous parts; but there is no elevated border, or distinguishing boundary between the discoloured part of the skin, and that which retains its natural colour. The discolouration rarely extends over the whole body. It is strongest and fullest round the umbilicus, on the breasts, and sides; it seldom appears in the skin over the sternum, or along the spine of the back. Interstices of proper skin colour are more numerous, and largest at the lower part of the abdomen and back, where the scales are often small, distinct, and a little depressed. The face, nates, and lower extremities are least affected; the patches are found upon the arms, but mostly on the inside, where they are distinct and of different sizes.

The pityriasis versicolor is not a cuticular disease; for when the cuticle is abraded from any of the patches, the sallow colour remains as before in the skin or retenuosum. This singular appearance is not attended with any internal disorder, nor with any troublesome symptom, except a little itching or irritation felt on getting into bed, and after strong exercise, or drinking warm liquors. There is in some cases a slight exanthema, partially distributed among the discoloured patches; and sometimes an appearance like the lichen pileus; but eruptions of this kind are not permanent, neither do they produce any change in the original form of the complaint. The duration of the pityriasis versicolor is always considerable. Dr. Willan has observed its continuance in some persons for four, five, or six years. It is not limited to any age or sex. Its causes are not pointed out with certainty. Several patients have referred it to fruit taken in too great quantities; some have thought it was produced by eating mushrooms; others by exposure to sudden alterations of cold and heat. In some individuals, who had an irritable skin, and occasionally used violent exercise, the complaint has been produced, or at least much aggravated, by wearing flannel next to the skin. It is likewise often observed in persons who had resided for a length of time in a tropical climate.

PIU. (Ital.) In music, a word of augmentation: as *piu presto*, quicker. *Piu piano*, more soft.

PIVA. A hautboy or cornet.

PIVOT, a foot, shoe, or extremity of iron, or other metal, usually conical, or terminating in a point, whereby a body intended to turn round bears on another fixed at rest, and performs its circumvolutions. The pivot usually bears or turns round in a sole, or piece of iron or brass hollowed to receive it.

PIURA, a town of Peru, capital of a jurisdiction of the same name. This was the first Spanish settlement in Peru, and was founded in 1531. It is 25 miles S.S.E. of Patia. Lon. 81. 0 W. Lat. 5. 55 S.

PIUS I. a pope and saint, succeeded Hyginus in 142. He was an Italian by birth, and suffered martyrdom in 157. He condemned the heresies of Valentinian.

PIUS II. (Ænea Sylvius Piccolomini), born in 1405, at Corsini in Sienna. In 1431 he became secretary to cardinal Dominic Capranica at the council of Basil, and acted in the same capacity to cardinal Albergotti, who sent him to Scotland to negotiate a peace between England and that country. On his return from this mission he was at the council of Basil, which he zealously defended against the authority of the popes. He was employed in several embassies, in which he shewed great dexterity. After obtaining some distinguished preferences, he was made a cardinal in 1456, and two years afterwards elected pope on the death of Calixtus III. On his promotion to this dignity he issued a bull, in which he retracted all that he had said and done with respect to the council of Basil. He behaved with great spirit

in his high office, and received ambassadors from the patriarchs of the east, who made their submission to the papal chair. Pius died in the midst of great preparations which he was making for a war with the Turks in 1464. His works were printed at Basil in 1551, folio.

PIUS III. (Francis Thodeschini), son of a sister of Pius II. succeeded Alexander VI. in the papal chair; but was suddenly snatched away 21 days after his election, 1503.

PIUS IV. (John Angelo, cardinal de Medicis), of Milan, was employed by Clement VII. in several embassies, and succeeded to the papedom, 1559. He re-established the council of Trent, and affirmed its decrees by a bull. He died 1565, aged 66.

PIUS V. (Michael Ghisleri), of Bosco, embraced the Dominican order. He was elected pope after Pius IV. 1566; but though he attempted to reform the morals of his church, and to correct abuses, his measures frequently degenerated into severity. His publication of the bull called *In Cæna Domini*, by which he attempted to enforce the superior jurisdiction of the papal see in temporal affairs, raised him many enemies. He joined the Spaniards and Venetians against the Turks, and under his auspices the famous battle of Lepanto was fought, 1571. He died of the stone 1572, aged 68, and was regarded as so formidable that Selim noticed his death by three days of public rejoicings.

PIUS VI. (John Angelo Braschi), was born at Cesena, 1717. He was made treasurer of the apostolic chamber, and raised to the rank of cardinal by Ganganelli, whom he succeeded as pope, 1775. His reign was one of the longest, and likewise one of the most unfortunate in the Roman history, and some assert, that in his pontificate was fully verified the Latin adage:

Semper sub Sextis perdita Roma fuit.

His government was marked by popular measures; he repressed abuses, and completed the noble museum of the Vatican, begun by his predecessor, by the collection of vases, medals, statues, and monuments. Of this treasure a magnificent account, with engravings, has appeared in 6 vols. folio. The port of Ancona was also repaired and embellished, and the Pontine marshes were drained of their pestilential waters. Canals were constructed to drain the marshes, the Appian way was repaired, or rather a new road was built 40 miles in length, with rows of poplars, and houses were erected for the convenience of travellers. In his character Pius was mild, and in his conduct hospitable; and Joseph II. of Germany, Paul of Russia, and other princes, were witnesses of his kindness and of his virtues. As the head of the church, Pius naturally disapproved of the French revolution, which seized or devoted all ecclesiastical establishments, and he embraced the cause of the allies. He received with kindness the banished priests, and this drew upon him the vengeance of the French rulers. Buonaparte was directed to attack the Roman states, and after taking Urbino, Bologna, An-

cona, &c. he offered peace to the sovereign pontiff, on condition of his paying a large sum of money, and of sending to Paris the choicest pieces in painting and sculpture at Rome. A reconciliation thus tyrannically effected proved not of long duration. The French ambassador was insulted and murdered by the populace, and in consequence the ecclesiastical territories were invaded. Rome was taken by the orders of Bonaparte, and the captive pope a prisoner in his palace, was conveyed amidst the insults of the French soldiery, first to Sienna, and afterwards across the Alps into France. At Briancon he converted the ferocity of his oppressors into admiration and reverence, and when he expected to be murdered by them, he saw the enraged multitude suddenly moved with compassion and fall down at his feet. From Briancon he passed on to Valence, where he was permitted to rest. Here his sufferings were completed; after an illness of 11 days from fatigue and old age, he died 29th August, 1798, aged 82. His remains were buried at Valence by order of Buonaparte; but afterwards they were removed to Rome in 1802, with great funeral pomp. This prelate, so well known by his misfortunes, was possessed of many virtues, and the humility and meekness with which he endured the indignities of his persecutors entitled him to universal veneration.

PIX. *s.* (*pixis*, Lat.) A little chest or box, in which the consecrated host is kept in Roman catholic countries (*Hanmer*).

PIX LIQUIDA. Vegetable tar. This tar is produced from the *pinus sylvestris* of Linneus, (*pinus foliis geminis rigidis, conis ovato-conicis longitudine foliorum subgeminis basi-rotundatis*. C. O. Monoecia, monadelphica), by cutting it into pieces, which are enclosed in a large oven constructed for the purpose. It is well known for its economical uses. Tar water, or water impregnated with the more soluble parts of tar, was some time ago a very fashionable remedy in a variety of complaints, but is in the present practice fallen into disuse.

PIZARRO (Francis), the conqueror of Peru, was the illegitimate son of a gentleman by a woman of low condition, and born at Truxillo. Though obliged to keep hogs for his support, he possessed an undaunted courage, and embarked for America. In 1524, fired with the love of glory, he united with Almagro and Lucque to go in quest of new undiscovered countries. After incredible hardships, he penetrated into Peru, 1531, where he seized the monarch Atahualpa, and afterwards cruelly put him to death. The possession of an opulent kingdom, and the submission of the inhabitants, did not inspire the Spaniards with the love of ease, but produced quarrels, and Almagro and Pizarro met in arms 1538. Almagro was defeated and put to death; but the son and the friends of the fallen chief united against their oppressor, and Pizarro was assassinated, after making an obstinate resistance, 26th June, 1541. This bold ad-

venturer, who knew not even how to read, was fully formed for command. He laid the foundations of Lima, and might deserve the name of a hero, were not perfidy and cruelty indelible stains on his character.

PIZZI (Joachim), of Rome, was in 1759 director of the academy of Arcades. He possessed genius as a poet, and vigour and correctness as a writer. His works are the vision of Eden, a poem in 4 cantos—the triumph of poetry, a poem—dissertation on an antique cameo, &c. He died 1790, aged 74.

PIZZICATO. (*Ital.*) An expression particularly applicable to violin music, and implying that the movement, or the passage over which it is written, is to be performed by the fingers instead of the bow.

PIZZIGHETONE, a town of Italy, in the Cremonese, with a strong castle in which Francis I. of France was kept prisoner. It was taken by the French in 1796, and retaken by the Austrians and Russians in 1799. It is situate on the Adda, nine miles N.W. of Cremona, and 13 S.E. of Lodi. Lon. 9. 53 E. Lat. 49. 50 N.

PIZZLE. *s.* (quasi *pissle*. *Minshew.*) The part in animals official to urine and generation (*Bacon*).

PLACABILITY. **PLA'CABLENESS.** *s.* (from *placable*.) Willingness to be appeased; possibility to be appeased.

PLA'CABLE. *a.* (*placabilis*, Latin.) Willing or possible to be appeased (*Milton*).

PLACARD. **PLACA'RT.** *s.* (*placard*, French.) An edict; a declaration; a manifesto.

To PLA'CATE. *v. a.* (*placeo*, Latin.) To appease; to reconcile (*Forbes*).

PLACE. *s.* (*place*, French.) 1. Particular portion of space (*Addison*). 2. Locality; ubiquity; local relation (*Locke*). 3. Local existence (*Revelation*). 4. Space in general (*Davies*). 5. Separate room (*Shakspeare*). 6. A seat; residence; mansion (*John*). 7. Passage in writing (*Bacon*). 8. Ordinal relation (*Addison*). 9. State of actual operation; effect (*Dryden*). 10. Existence; state of being (*Swift*). 11. Rank; order of priority (*Sh.*). 12. Precedence; priority (*Ben Jonson*). 13. Office; public character or employment (*Knolles*). 14. Room; way; space for appearing or acting given by cession (*Dryden*). 15. Ground; room (*Hammond*). 16. Station in life (*Duty of Man*).

To PLACE. *v. a.* (*placer*, French.) 1. To put in any place, rank, condition, or office (*Milton*). 2. To fix; to settle; to establish (*Locke*). 3. To put out at interest (*Pope*).

PLACE, in philosophy, that part of infinite space which any body possesses.

Aristotle and his followers divide place into external and internal.

Internal place, is that space or room which the body contains. And

External place, is that which includes or contains the body; and is by Aristotle called the first or concave and immoveable surface of the ambient body.

Newton better, and more intelligibly, distinguishes place into absolute and relative.

Absolute and primary place, is that part of infinite and immovable space which a body possesses. And

Relative, or secondary place, is the space it possesses considered with regard to other adjacent objects.

Dr. Clarke adds another kind of relative place, which he calls relatively common place; and defines it, that part of any moveable or measurable space which a body possesses; which place moves together with the body.

Place, Mr. Locke observes, is sometimes likewise taken for that portion of infinite space possessed by the material world; though this, he adds, were more properly called extension. The proper idea of place, according to him, is the relative position of any thing, with regard to its distance from certain fixed points; whence it is said a thing has or has not changed place, when its distance is or is not altered with respect to those bodies.

PLACE, in optics, or OPTICAL PLACE, is the point to which the eye refers an object.

PLACE (Optic), of a star, is a point in the surface of the mundane sphere in which a spectator sees the centre of the star, &c.—This is divided into true and apparent.

True, or real optic place, is that point of the surface of the sphere, where a spectator at the centre of the earth would see the star, &c.

Apparent, or visible optic place, is that point of the surface of the sphere, where a spectator at the surface of the earth sees the star, &c.

The distance between these two optic places makes what is called the parallax.

PLACE of the sun, or moon, or star, or planet, in astronomy, simply denotes the sign and degree of the zodiac which the luminary is in; and is usually expressed either by its latitude and longitude, or by its right ascension and declination.

PLACE, in geometry, usually called *locus*, is a line used in the solution of problems, being that in which the determination of every case of the problem lies. See LOCUS, PLANE, SIMPLE, SOLID, &c.

PLACE, in war and fortification, a general name for all kinds of fortresses, where a party may defend themselves.

PLACE of ARMS, a strong part where the arms, &c. are deposited, and where usually the soldiers assemble and are drawn up.

PLACE, in ichthyology. See PLEURO-NECTES.

PLACENTA, in anatomy, (from *πλάσις*, a cake, so called from its resemblance to a cake.) The placenta is a circular, flat, vascular, and apparently fleshy substance, different in its diameter in different subjects, but usually extending about six inches, or upwards, over about one-fourth part of the outside of the ovum in pregnant women. It is more than one inch in thickness in the middle, and becomes gradually thinner towards the circumference from which

the membranes are continued. The placenta is the principal medium by which the communication between the parent and child is preserved; but though all have allowed the importance of the office which it performs, there has been a variety of opinions on the nature of that office, and of the manner in which it is executed.

That surface of the placenta which is attached to the uterus by the intervention of the connecting membrane is lobulated and convex; but the other, which is covered with the amnion and chorion, is concave and smooth, except the little eminences made by the blood vessels. It is seldom found attached to the same part of the uterus in two successive births; and, though it most frequently adheres to the anterior part, it is occasionally fixed to any other, even to the os uteri, in which state it becomes a cause of a dangerous hæmorrhage at the time of parturition. The placenta is composed of arteries and veins, with a mixture of pulpy or cellular substance. Of these there are two orders, very curiously interwoven with each other. The first is a continuation of those from the funis, which ramify on the internal surface of the placenta, the arteries running over the veins, which is a circumstance peculiar to the placenta; and then, sinking into its substance, anastomose and divide into innumerable small branches. The second order proceeds from the uterus; and these ramify in a similar manner with those from the funis, as appears when a placenta is injected from those of the parent. The veins, in their ramifications, accompany the arteries as in other parts. There have been many different opinions with respect to the manner in which the blood circulates between the parent and child, during its continuance in the uterus. For a long time it was believed that the intercourse between them was uninterrupted, and that the blood propelled by the powers of the parent pervaded, by a continuance of the same force, the vascular system of the fetus; but repeated attempts having been made without success to inject the whole placenta, funis and fœtus, from the vessels of the parent, or any part of the uterus, from the vessels of the funis, it is now generally allowed, that the two systems of vessels in the placenta, one of which may be called maternal, the other fœtal, are distinct. It is also admitted, that the blood of the fœtus is, with regard to its formation, increase, and circulation, unconnected with and totally independent of the parent: except that the matter by which the blood of the fetus is formed must be derived from the parent. It is thought that which has probably undergone some preparatory changes in its passage through the uterus, is conducted by the uterine or maternal arteries of the placenta to some cells or small cavities, in which it is deposited; and that some part of it; or something secreted from it, is absorbed by the fœtal veins of the placenta, and by them conveyed to the fetus for its nutriment. When the blood which circulates in the fetus requires any alteration

in its qualities, or when it has gone through the course of the circulation, it is carried by the arteries of the funis to the placenta, in the cells of which it is deposited, and then absorbed by the maternal veins of the placenta, and conducted to the uterus, whence it may enter the common circulation of the parent. Thus it appears, according to the opinion of Harvey, that the placenta performs the office of a gland, conveying air, or secreting the nutritious juices from the blood brought from the parent by the arteries of the uterus, and carried to the fetus by the veins of the funis, in a manner probably not unlike to that in which milk is secreted and absorbed from the breasts. The veins in the placenta are mentioned as the absorbents, because no lymphatic vessels have yet been found in the placenta or funis; nor are there any nerves in these parts; so that the only communications hitherto discovered between the parent and child, is by the sanguineous system. The proofs of the manner in which the blood circulates between the parent and child are chiefly drawn from observations made upon the funis. When it was supposed that the child was supplied with blood in a direct stream from the parent, it was asserted that, on the division of the funis, if that part next to the placenta was not secured by a ligature, the parent would be brought into extreme danger by the hemorrhage which must necessarily follow. But this opinion, which laid the foundation of several peculiarities in the management of the funis and placenta, is proved not to be true: for, if the funis be compressed immediately after the birth of the child, and whilst the circulation in it is going on, the arteries between the part compressed and the child throb violently, but those between the compression and the placenta have no pulsation; but the vein between the part compressed and the placenta swells, and that part next to the fetus becomes flaccid. But if, under the same circumstances, the funis be divided, and that part next the child be not secured, the child would be in danger of losing its life by the hemorrhage; yet the mother would suffer no inconvenience if the other part was neglected. It is moreover proved, that a woman may die of an hemorrhage occasioned by a separation of the placenta, and the child be nevertheless born, after her death, in perfect health. But if the placenta be injured, without separation, either by the rupture of the vessels which pass upon its inner surface, or in any other way, the child being deprived of its proper blood, would perish, yet the parent might escape without injury. See also SECUNDINES.

PLACENTA, in botany. See RECEPTACULUM.

PLACENTATION, in botany, est cotyledonum dispositio sub ipsa seminis germinatione. The disposition of the cotyledons or lobes in the vegetation or germinating of the seed.—Hence vegetables are distributed into—
1. Acotyledones. 2. Monocotyledones. 3. Dicotyledones. 4. Polycotyledones.

PLACENTIA, or **PLACENZA**, a duchy of

Italy, formerly the western part of the duchy of Parma; bounded on the E. by that duchy, on the N. and W. by the Milanese, and on the S. by the territory of Genoa. It is very fertile and populous, and contains mines of iron, and salt springs, from which is made a very white salt. The principal rivers are the Trebia and Nurra. It was divided between the queen of Hungary and the king of Sardinia, by the treaty of Worms, in 1743.

PLACENTIA, or **PLACENZA**, a town of Italy, capital of a duchy of the same name, with a bishop's see, a citadel, and a celebrated university. The churches, squares, streets, and fountains, are beautiful, and it contains 30,000 inhabitants. It was ceded to the king of Sardinia in 1743; and the French took possession of it in 1796. It is seated in a well cultivated country, on the river Po, 32 miles N.W. of Parma, and 83 E. of Turin. Lon. 9. 38 E. Lat. 45. 5 N.

PLACENTIA, a town of Spain, in Estremadura, with a bishop's see, and a castle. It is seated on the Xera, in a delightful plain, almost surrounded by mountains, 80 miles S.W. of Madrid. Lon. 5. 0 W. Lat. 39. 45 N.

PLACENTIA, a town of Spain, in Guipuscoa, seated on the Deva, 25 miles S.E. of Bilbao. Lon. 2. 40 W. Lat. 43. 10 N.

PLACENTIA, a seaport of Newfoundland, on a bay on the S.E. part of the island, 40 miles W. of St. John. Lon. 53. 43 W. Lat. 47. 15 N.

PLACER. *s.* (from *place*.) One who places.

PLACID. *a.* (*placidus*, Latin.) 1. Gentle; quiet; not turbulent (*Bacon*). 2. Soft; kind; mild (*Milton*).

PLACIDLY. *ad.* Mildly; gently (*Boyle*).

PLACIT. *s.* (*placitum*, Lat.) Decree; determination (*Glanville*).

PLACKET, or **PLAQUET**. *s.* A petticoat (*Shakspeare*).

PLAGAL, in music, an epithet used in opposition to authentic, and applied to the octave when arithmetically divided. When a melody is so constructed as to lie between the two extremes of an octave, making its final on one of those extremes, the mode is said to be authentic, but if the final be on the dominant, the mode is called plagal. These distinctions have, however, long since ceased to be noticed, and are only known in the old music of the church.

PLAGIANTHUS, in botany, a genus of the class monadelphia, order dodecandria. Calyx five-cleft; petals five, two of them approximate and remote from the rest; style one; stigma clavate; berry doubtful. One species, a New Zealand shrub.

PLAGIARISM. *s.* (from *plagiar*.) Literary theft; adoption of the thoughts or works of another (*Swift*).

PLAGIARY. *s.* (from *plagium*, Latin.) 1. A thief in literature; one who steals the thoughts or writings of another (*South*). 2. The crime of literary theft (*Brown*).

P L A G I A R Y.

Among the Romans, *plagiarius* was properly a person who bought, sold, or retained a freeman for a slave; and was so called because by the Flavian law such persons were condemned *ad plagas*, to be whipped. Thomasius has an express treatise *De plagio literario*; wherein he lays down the laws and measures of the right which authors have to one another's writings.—“Dictionary-writers, at least such as meddle with arts and sciences (as is pertinently observed by Mr. Chambers), seem exempted from the common laws of *meum* and *tuum*; they do not pretend to set up on their own bottom, nor to treat you at their own cost. Their works are supposed, in great measure, compositions of other people; and what they take from others, they do it avowedly, and in the open sun.—In effect, their quality gives them a title to every thing that may be for their purpose, wherever they find it; and if they rob, they do not do it, any otherwise than as the bee does, for the public service. Their occupation is not pillaging, but collecting contributions; and if you ask them their authority, they will produce you the practice of their predecessors of all ages and nations.”

It may not be amiss to remark that in many instances there may be apparent plagiarism where there is none in reality. A remarkable instance is that which relates to Leslie's most valuable work, his *Short and Easy Method with the Deists*. This seems to be a perfectly original treatise; yet it is published in French among the works of the Abbé St. Real, who died in 1692; and therefore it has been said, that unless it was published in English prior to that period, Charles Leslie must be considered as a shameless plagiarist.

The English work was certainly not published prior to the death of Abbé St. Real; for the first edition bears date July 17th, 1697; and yet many reasons conspire to convince us, that our countryman was no plagiarist. There is indeed a striking similarity between the English and the French works; but this is no complete proof that the one was copied from the other. The article *PHILOLOGY* in the *Encyclopædia Britannica*, of which Dr. Doig is the author, was published the very same week with Dr. Vincent's dissertation on the Greek verb. It was therefore impossible that either of these learned men, who were till then strangers to each others names, could have stolen aught from the other; and yet Dr. Vincent's derivation of the Greek verb bears as striking a resemblance to Dr. Doig's as the Abbé St. Real's work does to Charles Leslie's. In the article *MIRACLE* in the same *Encyclopædia*, the credibility of the gospel miracles is established by an argument, which the author certainly borrowed from no man, and which the late principal Campbell considered as original; yet within half a year of the publication of that article, the credibility of the gospel miracles was treated in the very same manner by F. Sayers, M. D. though there is in his dissertation complete internal evidence that he had not seen the article in the *Encyclopædia*.

After these instances of apparent plagiarism, which we know to be only apparent, has any man a right to say that Charles Leslie and the Abbé St. Real might not have treated their subject in the way that they have done, without either borrowing from the other? The coincidence of arrangement and reasoning in the two works is indeed very surprising; but it is by no means so surprising as the coincidence of etymological deductions which appears in the works of the doctors Doig and Vincent. The divines reason from the acknowledged laws of human thought; the reasonings of the grammarians, with all due deference to their superior learning, we cannot help considering as sometimes fanciful.

But this is not all that we have to urge on the subject. If there be plagiarism in the case, and the identity of titles looks very like it, it is infinitely more probable that the editor of St. Real's works stole from Leslie than that Leslie stole from St. Real, unless it can be proved that the works of the abbé, and this work in particular, were published before the year 1697. At that period the English language was very little read or understood on the continent; whilst in Britain the French language was, by scholars, as generally understood as at present. Hence it is that so many Frenchmen, and indeed foreigners of different nations, thought themselves safe in pilfering science from the British philosophers; whilst there is not, that we know, one well authenticated instance of a British philosopher appropriating to himself the discoveries of a foreigner. If, then, such men as Leibnitz, John Bernoulli, and Des Cartes, trusting to the improbability of detection, condescended to pilfer the discoveries of Hooke, Newton, and Harriot, is it improbable that the editor of the works of St. Real would claim to his friend a celebrated tract, of which he knew the real author to be obnoxious to the government of his own country, and therefore not likely to have powerful friends to maintain his right?

But farther, Burnet, bishop of Sarum, was an excellent scholar, and well read, as every one knows, in the works of foreign divines. Is it conceivable, that this prelate, when smarting under the lash of Leslie, would have let slip so good an opportunity of covering with disgrace his most formidable antagonist, had he known that antagonist to be guilty of plagiarism from the writings of the Abbé St. Real? Let it be granted, however, that Burnet was a stranger to these writings and to this plagiarism; it can hardly be supposed that Le Clerc was a stranger to them likewise. Yet this author, when, for reasons best known to himself, he chose (1706) to depreciate the argument of the short method, and to traduce its author as ignorant of ancient history, and as having brought forward his four marks for no other purpose than to put the deceitful traditions of popery on the same footing with the most authentic doctrines of the gospel, does not so much as insinuate that he borrowed these marks from a popish abbé.

PLA

PLAGUE. *s.* (*plaghe*, Dutch; *πληγή*.) 1. Pestilence; a disease eminently contagious and destructive (*Bacon*). 2. State of misery (*Psalms*). 3. Any thing troublesome or vexatious (*Prior*).

To PLAGUE. *v. a.* (from the noun.) 1. To infect with pestilence. 2. To infect with disease; to oppress with calamity (*Shaks. Milt.*). 3. To trouble; to tease; to vex; to harass; to torment; to afflict (*Collier*).

PLAGUE, in medicine **PESTIS**, a genus of exanthematous or eruptive fever of the typhus kind; exceedingly contagious, and accompanied with the utmost degree of debility. The exanthemata are buboes or carbuncles which issue at an uncertain period. It appears to have various species; but these have not been sufficiently defined for a regular classification. The most valuable treatise we yet possess upon the subject is that of Dr. Patrick Russell, formerly physician to the British factory at Aleppo. In this work a very full history is given of its numerous forms, and of many of its varieties. The term plague is often used in a vague and indefinite sense to signify contagious fevers of a different description, and especially the Bussorot remittent fever; which though extremely fatal, has but little resemblance to it, and occurs at a different season of the year. For the generic arrangement, description, and mode of treatment of plague or pestis, see the article **MEDICINE**, Part III. *Nosology*, Class i. Order iii. Genus xxvii: and Part IV. *Practice*, Order iii. Section *Exanthemata*.

PLA'GUILY. *ad.* (from *plaguy*.) Vexatiously; horribly (*Dryden*).

PLA'GUY. *a.* (from *plague*.) Vexatious; troublesome (*Donne*).

PLAICE. *s.* (*plate*, Dutch.) A flat fish. See **PLEURONECTES**.

PLAID. *s.* A striped or variegated cloth; an outer loose weed worn much by the highlanders in Scotland.

PLAIN. *a.* (*planus*, Lat.) 1. Smooth; level; flat; free from protuberance or excrescences. In this sense, especially in philosophical writings, it is frequently written *plane* (*Spenser*). 2. Open; clear; flat (*Felton*). 3. Void of ornament; simple (*Dryden*). 4. Artless; not subtle; not specious; not learned; simple (*Hammond*). 5. Honestly rough; open; sincere; not soft in language (*Bacon*). 6. Mere; bare (*Shakspeare*). 7. Evident; clear; discernible; not obscure (*Denham*). 8. Not varied by much art; simple (*Sidney*).

PLAIN. *ad.* 1. Not obscurely. 2. Distinctly; articulately (*Mark*). 3. Simply; with rough sincerity (*Addison*).

PLAIN. *s.* (*plaine*, Fr.) Level ground; open field; flat expanse; often, a field of battle.

To PLAIN. *v. a.* (from the noun.) To level; to make even (*Hayward*).

To PLAIN. *v. n.* (*plaindre, je plains*, Fr.) To lament; to wail (*Sidney*).

PLAINDEA'LING. *a.* (*plain and deal*.) Honest; open; acting without art (*L'Es-trange*).

PLA

PLAINDEA'LING. *s.* Management void of art; sincerity (*Dryden*).

PLAINLY. *ad.* (from *plain*.) 1. Levelly; flatly. 2. Not subtly; not speciously. 3. Without ornament. 4. Without gloss; sincerely (*Pope*). 5. In earnest; fairly (*Clar.*). 6. Evidently; clearly; not obscurely (*Milt.*).

PLAINNESS. *s.* (from *plain*.) 1. Levelness; flatness. 2. Want of ornament; want of show (*Pope*). 3. Openness; rough sincerity (*Sidney*). 4. Artlessness; simplicity (*Dryden*).

PLAIN-SONG, in music, the name given to the old ecclesiastical chant, when in its most simple state, and without those harmonic appendages with which it has long since been enriched by cultivated science.

PLAIN SAILING. See **NAVIGATION**.

PLAIN TABLE. See **PLANE TABLE**.

PLAINT. *s.* (*plainte*, French.) 1. Lamentation; complaint; lament (*Sidney*). 2. Exprobation of injury (*Bacon*). 3. Expression of sorrow (*Wotton*).

PLAINTFUL. *a.* (*plaint and full*.) Complaining; audibly sorrowful (*Sidney*).

PLAINTIF. *s.* (*plaintif*, Fr.) He that commences a suit in law against another: opposed to the *defendant* (*Dryden*).

PLAINTIF. *a.* (*plaintif*, Fr.) Complaining: not in use (*Prior*).

PLAINTIVE. *a.* (*plaintif*, French.) Complaining; lamenting; expressive of sorrow (*Dryden*).

PLAINWORK. *s.* (*plain and work*.) Needle-work as distinguished from embroidery.

PLAISE. See **PLEURONECTES**.

PLAIT. *s.* (corrupted from *plight* or *plyght*.) A fold; a double (*Davies*).

To PLAIT. *v. a.* (from the noun.) 1. To fold; to double (*Pope*). 2. To weave; to braid (*Peter*). 3. To intangle; to involve (*Shakspeare*).

PLAITER. *s.* (from *plait*.) He that plaits.

PLAN. *s.* (*plan*, French.) 1. A scheme; a form; a model (*Addison*). 2. A plot of any building, or ichnography.

To PLAN. *v. a.* (from the noun.) To scheme; to form in design (*Pope*).

PLAN, in general, denotes the representation of something drawn on a plane: such are maps, charts, ichnographies, &c. See **MAP**, **CHART**, &c.

The term **plan**, however, is particularly used for a draught of a building, such as it appears, or is intended to appear, on the ground; shewing the extent, division, and distribution of its area, or ground-plot, into apartments, rooms, passages, &c. A geometrical plan is that, wherein the solid and vacant parts are represented in their natural proportions. The raised plan of a building, is the same with what is otherwise called an elevation, or orthography. A perspective plan, is that exhibited by degradations, or diminutions, according to the rules of perspective.

PLANARIA, in zoology, a genus of the class vermes, order intestina. Body gelatinous,

flattish, with a double ventral pore; mouth terminal. Forty-seven species, thus subdivided.

- A. Without eyes.
- B. With a single eye.
- C. With two eyes.
- D. With three eyes.
- E. With four eyes.
- F. Eyes numerous.

These are all inhabitants of Europe, chiefly of Denmark and Norway: two or three only are met with in our own country. The following will serve as specimens.

1. *P. operculata*. Body subovate, greenish-grey, with a paler line down the back, beneath paler still; furnished with a white lid which conceals the exsertile tube. Inhabits, though rarely, the sandy shores and among fuci in the bays of Norway, resembling a coffee-berry; and moves by bending its margin, and by means of its marginal folds fixes itself to and ascends other bodies.

2. *P. subulata*. Body long, pointed on the fore-part, and truncate behind. Inhabits in great plenty among marine conservæ in Greenland, and the muddy bottoms of holes in rocks which retain water through the summer, and proceeds with a serpentine kind of motion; but if the proboscis be touched, it contracts itself suddenly into a minute tube: body white, above greyish.

3. *P. quadrangularis*. Body pale, ovate, very sharp-pointed before, and winged with small, curled, longitudinal membranes. Found in the north of Europe in ditches among duckweed; very soft, pellucid, of a changeable form, and moves like a slug, leaving a slime on the bodies it passes over. When it meets another animal it draws itself in like a snail.

PLANARY. *a.* Pertaining to a plane.

PLANCHED. *a.* (from *planch.*) Made of boards (*Shakspeare*).

PLANCHER. *s.* (*plancher*, French.) A floor of wood: not used (*Bacon*).

PLANCHING. *s.* (In carpentry.) The laying the floors in a building.

PLANCINA, a woman celebrated for her intrigues and her crimes, who married Piso, and was accused with him of having murdered Germanicus, in the reign of Tiberius. She was acquitted either by means of the empress Livia, or on account of the partiality of the emperor for her person. Subservient in every thing to the will of Livia, she, at her instigation, became guilty of the greatest crimes, to injure the character of Agrippina. After the death of Agrippina, Plancina was accused of the most atrocious villanies, and as she knew that she could not elude justice, she put herself to death, A. D. 33.

PLANCUS MUNATIUS (L), a Roman consul, who forgot all his dignity, and became one of the most servile flatterers of Cleopatra and Antony. At the court of Alexandria, he appeared in the character of the meanest stage dancer, and, in comedy, he personated the sea deity Glaucus. This exposed him to public derision, and, when Antony had censured

him for his unbecoming behaviour, he deserted to Octavius, who received him with great marks of friendship and attention. It was he who proposed, in the Roman senate, that the title of Augustus should be conferred on Octavius. Horace has dedicated 1 od. 7 to him. He founded a town in Gaul, which he called Lugdunum.

PLANE, or **PLAIN**, in geometry, denotes a flat figure, or a surface lying evenly between its bounding lines. Euclid.

Some define a plane, a surface, from every point of whose perimeter a right line may be drawn to every other point in the same, and always coinciding with it.

As the right line is the shortest extent from one point to another, so is a plane the shortest extension between one line and another.

Planes are much used in astronomy, conic sections, spherics, &c. for imaginary surfaces, supposed to cut and pass through solid bodies.

When a plane cuts a cone parallel to one side, it makes a parabola; when it cuts the cone obliquely, an ellipse or hyperbola; and when parallel to its base, a circle. Every section of a sphere is a circle.

The sphere is wholly explained by planes, conceived to cut the celestial bodies, and to fill the areas or circumferences of the orbits. They are differently inclined to each other; and by us the inhabitants of the earth, the plane of whose orbit is the plane of the ecliptic, their inclination is estimated with regard to this plane.

PLANE OF A DIAL, is the surface on which a dial is supposed to be described.

PLANE, in mechanics. *A horizontal plane*, is a plane that is level, or parallel to the horizon.

Inclined plane, is one that makes an oblique angle with a horizontal plane.

The doctrine of the motion of bodies on inclined planes makes a very considerable article in mechanics, and has been fully explained under the articles **MECHANICAL POWERS**, and **INCLINED PLANE**.

PLANE OF GRAVITY, or **GRAVITATION**, is a plane supposed to pass through the centre of gravity of the body, and in the direction of its tendency; that is, perpendicular to the horizon.

PLANE OF REFLECTION, in catoptrics, is a plane which passes through the point of reflection; and is perpendicular to the plane of the glass, or reflecting body.

PLANE OF REFRACTION, is a plane passing through the incident and refracted ray.

PLANE OF THE PROJECTION, is the plane upon which the sphere is projected.

PLANE ANGLE, is an angle contained under two lines or surfaces. It is so called in contradiction to a solid angle, which is formed by three or more planes.

PLANE TRIANGLE, is a triangle formed by three right lines; in opposition to a spherical and a mixt triangle:

PLANE TRIGONOMETRY, is the doctrine of plane triangles, their measures, proportions, &c. See **TRIGONOMETRY**.

PLANE GLASS, or **MIRROR**, in optics, is a glass or mirror having a flat or even surface.

PLANE CHART, in navigation, is a sea-chart, having the meridians and parallels represented by parallel straight lines; and consequently having the degrees of longitude the same in every part. See **CHART**.

PLANE NUMBER, is that which may be produced by the multiplication of two numbers the one by the other. Thus, 6 is a plane number, being produced by the multiplication of the two numbers 2 and 3; also 15 is a plane number, being produced by the multiplication of the numbers 3 and 5. See **NUMBER**.

PLANE PLACE, (*locus planus*, or *locus ad planum*), is a term used by the ancient geometers, for a geometrical locus, when it was a right line or a circle, in opposition to a solid place, which was one of the conic sections.

These plane loci are distinguished by the moderns into *loci ad rectum*, and *loci ad circum*. See **LOCUS**.

PLANE PROBLEM, is such a one as cannot be resolved geometrically, but by the intersection either of a right line and a circle, or of the circumferences of two circles. Such as this problem following: viz. Given the hypotenuse, and the sum of the other two sides, of a right-angled triangle; to find the triangle. Or this: of four given lines to form a trapezium of a given area.

PLANE SAILING, in navigation, is the art of working the several cases and varieties in a ship's motion on a plane chart. See **NAVIGATION**.

PLANE, or **PLAIN TABLE**, in surveying, a very simple instrument, whereby the draught of a field is taken on the spot, without any future protraction. It is generally of an oblong rectangular figure, and supported by a fulcrum, so as to turn every way by means of a ball and socket. It has a moveable frame, which serves to hold fast a clean paper; and the sides of this frame, facing the paper, are divided into equal parts every way. It has also a box with a magnetical needle, and a large index with two sights; and, lastly, on the edge of the frame, are marked degrees and minutes. See **SURVEYING**.

PLANE, in joinery, an edged tool, or instrument for paring and shaving of wood smooth. It consists of a piece of wood, very smooth at bottom, as a stock or shaft; in the middle of which is an aperture, through which a steel-edge, or chisel, placed obliquely, passes; this being very sharp, takes off the inequalities of the wood it is slid along. Planes have various names, according to their various forms, sizes, and uses: as, 1. The fore-plane, which is a very long one, and is usually that which is first used: the edge of its iron or chisel is not ground straight, but rises with a convex arch in the middle; its use is to take off the greater

irregularities of the stuff, and to prepare it for the smoothing-plane. 2. The smoothing-plane is short and small, its chisel being finer; its use is to take off the greater irregularities left by the fore-plane, and to prepare the wood for the jointer. 3. The jointer is the longest of all; its edge is very fine, and does not stand out above an hair's breadth; it is chiefly used for shooting the edge of a board perfectly straight, for jointing tables, &c. 4. The strike-block, which is like the jointer, but shorter: its use is to shoot short joints. 5. The rabbit-plane, which is used in cutting the upper edge of a board, straight or square, down into the stuff, so that the edge of another cut after the same manner may join in with it, on the square; it is also used in striking facias on mouldings: the iron or chisel of this plane is as broad as its stock, that the angle may cut straight, and it delivers its shavings at the sides, and not at the top, like the others. 6. The plough, which is a narrow-rabbit plane, with the addition of two staves, on which are shoulders: its use is to plough a narrow square groove on the edge of a board. 7. Moulding-plane, which are of various kinds, accommodated to the various forms and profiles of the moulding; as the round-plane, the hollow-plane, the ogee, the snipe's bill, &c. which are all of several sizes from half an inch to an inch and a half.

PLANE-TREE. See **PLATANUS**.

PLANE-TREE (False). See **ACER**.

To **PLANE**. *v. a.* (*planer*, French.) 1. To level; to smooth; to free from inequalities (*Arbutnot*). 2. To smooth with a plane.

PLANET, a celestial body, revolving round the sun as a centre, and continually changing its position with respect to the fixed stars; whence the name planet, which is a Greek word signifying wanderer.

The planets are usually distinguished into primary and secondary. The primary ones, called by way of eminence planets, are those which revolve round the sun as a centre; and the secondary planets, more usually called satellites or moons, are those which revolve round a primary planet as a centre, and constantly attend it in its revolution round the sun.

The primary planets are again distinguished into superior and inferior. The superior planets are those farther from the sun than our earth: as Ceres, Pallas, Vesta, Juno, Mars, Jupiter, Saturn, and the Georgium Sidus; and the inferior planets are those nearer the sun than our earth, as Venus and Mercury. See **ASTRONOMY**.

That the planets are opaque bodies, like our earth, is inferred from the following reasons: 1. Since in Venus, Mercury, and Mars, only that part of the disk illuminated by the sun is found to shine; and again, Venus, and Mercury, when between the earth and the sun, appear like dark spots or maculæ on the sun's disk; it is evident, that Mars, Venus, and Mercury, are opaque bodies illuminated with the borrowed light of the sun. And the same

appears of Jupiter, from its being void of light in that part to which the shadow of the satellites reaches, as well as in that part turned from the sun; and that his satellites are opaque, and reflect the sun's light, is abundantly shown. Again, since Saturn, with his ring and satellites, only yields a faint light, fainter considerably than that of the fixed stars, though these be vastly more remote, and than that of the rest of the planets; it is past doubt that he too and his attendants are opaque bodies. 2. Since the sun's light is not transmitted through Mercury and Venus, when placed against him, it is plain they are dense opaque bodies; which is likewise evident of Jupiter, from his hiding the satellites in his shadow; and therefore, by analogy, the same may be concluded of Saturn. 3. From the variable spots of Venus, Mars, and Jupiter, it is evident these planets have a changeable atmosphere; which changeable atmosphere may, by a like argument, be inferred of the satellites of Jupiter; and therefore, by similitude, the same may be concluded of the other planets. 4. In like manner, from the mountains observed in Venus, the same may be supposed in the other planets. 5. Since, then, Saturn, Jupiter, and the satellites of both Mars, Venus, and Mercury, are opaque bodies shining with the sun's borrowed light, are furnished with mountains, and encompassed with a changeable atmosphere; they have, of consequence, waters, seas, &c. as well as dry land, and are bodies like the moon, and therefore like the earth. Q. E. D. And hence it seems also highly probable that the other planets have their animal inhabitants as well as our earth.

PLANETARIUM, an astronomical machine, contrived to represent the motions, orbits, &c. of the planets, as they really are in nature, or according to the Copernican system. A very remarkable machine of this sort was invented by Huygens, which is still preserved among the curiosities of the University at Leyden. In this planetarium, the five primary planets perform their revolutions about the sun, and the moon performs her revolution about the earth, in the same time that they are really performed in the heavens. Also the orbits of the moon and planets are represented with their true proportions, excentricity, position, and declination from the ecliptic or orbit of the earth. So that, by this machine, the situation of the planets, with the conjunctions, oppositions, &c. may be known, not only for the present time, but for any other time, either past or yet to come, as in a perpetual ephemeris. There was exhibited in London, viz. in the year 1791, a still much more complete planetarium of this sort, called "a planetarium, or astronomical machine, which exhibits the most remarkable phenomena, motions, and revolutions of the universe; invented, and partly executed, by the celebrated M. Hahn, member of the academy of sciences at Erfurt; but finished and completed by M. A. de Mylius." This is a most stupendous and elaborate

machine, consisting of the solar system in general, with all the orbits and planets in their due proportions and positions; as also the several particular planetary systems of such as have satellites, as of the earth, Jupiter, &c.; the whole kept in continual motion by a chronometer, or grand eight-day clock; by which all these systems are made perpetually to perform all their motions exactly as in nature, exhibiting at all times the true and real motions, positions, aspects, phenomena, &c. of all the celestial bodies, even to the very diurnal rotation of the planets, and the unequal motions in their elliptic orbits. A description was published of this most superb machine; and it was purchased and sent as one of the presents to the emperor of China, in the embassy of lord Macartney. See ORRERY.

PLANETARY. *a.* (*planetaire*, French.) 1. Pertaining to the planets (*Granville*). 2. Under the domination of any particular planet (*Dryden*). 3. Produced by the planets (*Shakespeare*). 4. Having the nature of a planet; erratic (*Blackmore*).

PLANETARY YEAR, DAY, and HOUR. See YEAR, DAY, and HOUR.

PLANETIC, in medicine, erratic, wandering. A term applied to fevers and other diseases which preserve no regular course or period.

PLANET-STRUCK, or SHREW-RUN, in farriery. This distemper in horses is a kind of catalepsy, or privation of feeling or motion. Not stirring any of their members, they remain in the same form as when first seized. It is an universal spasm, and to be treated like a convulsive disorder.

The ancient farriers, and many of the country people to this day, when they see a horse or bullock have the use of his limbs suddenly taken from him, and not being able to think what should be the cause of such an unexpected change, believe him either to be planet-struck or shrew-run, whence the name.

PLANIFOLIOUS. *a.* (*planus* and *folium*, Latin.) Flowers are so called, when made up of plain leaves.

PLANIMETRICAL. *a.* (from *planimetry*.) Pertaining to the mensuration of plane surfaces.

PLANIMETRY. *s.* (*planus*, Latin; and *μετρον*.) The mensuration of plane surfaces.

PLANIPETALOUS. *a.* (*planus*, Latin, and *πεταλον*.) Flatleaved, as when the small flowers are hollow only at the bottom, but flat upward, as in dandelion and succory.

To PLANISH. *v. a.* (from *plane*.) To polish; to smooth. A word used by manufacturers.

PLANISPHERE, signifies a projection of the sphere, and its various circles on a plane; in which sense maps, wherein are exhibited the meridians, and other circles of the sphere, are planispheres. See MAP, SPHERE, &c.

PLANISPHERE, is more particularly used for an astronomical instrument used in observing the motions of the heavenly bodies. It

consists of a projection of the celestial sphere upon a plane, representing the stars, constellations, &c. in their proper order; some being projected on the meridian, and others on the equator.

The use of the planisphere is to represent the face of the heavens for any day and hour.

PLANK. *s.* (*planche*, Fr.) A thick strong board (*Chapman*).

To **PLANK.** *v. a.* (from the noun.) To cover or lay with planks (*Dryden*).

PLANOCONICAL. *a.* (*planus* and *conus*, Lat.) Level on one side and conical on others (*Grew*).

PLANOCONVEX. *a.* (*planus* and *convexus*, Lat.) Flat on the one side and convex on the other (*Newton*).

PLANT, in botany, an organic vegetable body, consisting of roots and other parts. Whether capable either of sensation, or of spontaneous motion, is not yet fully ascertained. It attaches itself to other bodies, in such a manner as to derive nourishment from them, and to propagate itself by seeds. The constituent parts of plants are the roots, stems, branches, rind, or bark, leaves, flowers, and seeds; which greatly vary, both in figure and size, according to the nature of particular trees, shrubs, &c. Their various appearances have induced botanists to divide the vegetable kingdom into orders, classes, genera, species, and varieties; for an account of which, see **BOTANY**.

Thus plant is synonymous with vegetable; but frequently used in a more restricted sense. Plants are placed by Linnæus in the last of the seven families into which he has distributed the whole vegetable kingdom. Comprehending all that are not funguses, algæ, mosses, ferns, grasses, or palms. They are, 1. Herbaceous. 2. Shrubs. 3. Trees. Philos. Bot. p. 37. In Regn. Veg. he has sunk the word plantæ; and has divided them into lilia, herbæ, arbores.

PLANT (Burning thorny). See **EUPHORBIA**.

PLANT (Egg). See **SOLANUM**.

PLANT (Humble). See **MIMOSA**.

PLANT (Ice). See **MESENBRYANTHEMUM**.

PLANT (Sensitive). See **MIMOSA**.

PLANT (Bastard sensitive). See **ASCHYNOMENE**.

PLANT COAST, the name given to Botany Bay, by its original discoverer, as marked on a map in the British Museum, which is at least as old as the time of Henry VIII. Diemen's land is also marked on the same map.

PLANT (Louse). See **APHIS**.

To **PLANT.** *v. a.* (*planto*, Lat. *planter*, Fr.) 1. To put into the ground in order to grow; to set; to cultivate (*Deuteronomy*). 2. To procreate; to generate (*Shakspeare*). 3. To place; to fix (*Dryden*). 4. To settle; to establish: as, to plant a colony (*Milton*). 5. To fill or adorn with something planted: as, he planted the garden or the country. 6. To direct properly: as, to plant a cannon.

PLANTAGE. *s.* (*plantago*, Latin.) An herb, or herbs in general (*Shakspeare*).

PLANTAGENET, the surname of the kings of England from Henry II. to Richard III. inclusive. Antiquarians are much at a loss to account for the origin of this name; and the best derivation they can find for it is, that Fulk, the first earl of Anjou of that name, being stung with remorse for some wicked action, went in pilgrimage to Jerusalem as a work of atonement; where being soundly scourged with broom twigs, which grew plentifully on the spot, he ever after took the surname of plantagenet or broomstalk, which was retained by his noble posterity.

PLANTAGO. Plantain. In botany, a genus of the class tetandria, order monogynia. Calyx four-cleft; corol four-cleft, inferior, with a reflected border; stamens very long, capsule two-celled, opening transversely. Thirty-five species scattered over the globe; five common to our own country: most of them with a naked scape; a few furnished with a stem. The following are the indigenous plants.

1. *P. major*. Broad-leaved plantain. Leaves ovate, nearly glabrous, shorter than the petiole; scape round; spike with imbricate flowers; seeds numerous. Found wild in our meadows.

2. *P. media*. Hoary plantain, or lamb's-tongue. Leaves ovate, pubescent, longer than the petioles; scape round; spike cylindrical; seeds solitary. Common to our meadows.

3. *P. lanceolata*. Narrow-leaved plantain. Ribwort. Leaves lanceolate, tapering at both ends; spike ovate, naked; scape angular. Often cultivated in the vales of Gloucestershire.

4. *P. maritima*. Sea plantain. Leaves linear, mostly entire, woolly at the base, channelled; spike cylindrical; scape round. Found on our muddy shores.

5. *P. coronopus*. Buck's-horn plantain. Leaves linear, in many pinnate segments; scape round. Found on our dry heaths and sands; formerly cultivated as a salad, but long relinquished on account of its disagreeable taste.

PLANTAIN. See **PLANTAGO**.

PLANTAIN-TREE. See **HELICONIA**.

PLANTARIS. (from *planta*, the sole of the foot, to which it belongs.) Tibialis gracilis vulgo plantaris of Winslow. Extensor tarsi minor vulgo plantaris of Douglas. In myology, a muscle of the foot, situated on the leg, that assists the soleus, and pulls the capsular ligament of the knee from between the bones. It is sometimes, though seldom, found wanting on both sides. This long and slender muscle, which is situated under the gastrocnemius externus, arises, by a thin fleshy origin, from the upper and back part of the outer condyle of the os femoris. It adheres to the capsular ligament of the joint, and, after running obliquely downwards and outwards, for the space of three or four inches, along the second origin of the gastrocnemius internus, and under the gastrocnemius externus, terminates in a

long, thin, and slender tendon, which adheres to the inside of the tendo Achillis, and is inserted into the inside of the posterior part of the os calcis. This tendon sometimes sends off an aponeurosis that loses itself in the capsular ligament, but it does not at all contribute to form the aponeurosis that is spread over the sole of the foot, as was formerly supposed, and as its name would seem to imply. Its use is to assist the gastrocnemii in extending the foot. It likewise serves to prevent the capsular ligament of the knee from being pinched.

PLANTATION. *s.* (*plantatio*, Latin.) 1. The act or practice of planting. 2. The place planted (*King Charles*). 3. A colony (*Bacon*). 4. Introduction; establishment (*K. Charles*).

PLANTATION, in gardening, a large collection of different sorts of trees disposed for ornament or grown for the advantage of their timber; and not unfrequently uniting both purposes.

Under proper regulations there are few better means of improving estates, and certainly no means so essential towards an ornamental improvement of the country. Hence they are particularly worthy of attention wherever there are large tracts of poor barren lands that cannot be converted to purposes of grass or tillage.

The expence attending the formation of plantations, and the knowledge that many years must elapse before the trees can make any considerable progress, or afford any advantage, often prove an obstacle of no small weight; but if the plants be raised on the ground in a small nursery for the purpose, the expence will be very much diminished, since in such a situation plants enough may be raised in three or four years to stock a considerable number of acres; and even this with the collateral expence of transplanting, and the loss of time in waiting till the plants have attained some size, will be compensated by the first fall or thinning, in eight or ten years after planting; while the stocks which remain will shoot up again in many of the deciduous kinds, and afford a lopping every eight or ten years, exclusively of the due proportion of standards left at proper distances, to attain full growth for timber.

In forming plantations the first object of attention is to make choice of such trees as are best adapted to the nature of the particular soil and situation. That of the deciduous and ever-green kinds may be employed with propriety, and young plants of from two or three to five or ten feet in height always prove more successful than such as are older. Many persons indeed, from being in haste to have plantations as forward as possible, transplant tall trees, often of a height of twelve or fifteen feet or even more, especially among those of the ornamental kind; yet it will uniformly be found that those of younger growth always take root sooner, and establish themselves more firmly, so as to form by far the finest plantations at last, and of much the longest duration; for the large trees, from not properly rooting, like the smaller, will often fail

after they have appeared to thrive tolerably for a few years, and at length gradually dwindle away and perish.

Where ornament is chiefly intended the different kinds of hardy trees made choice of, for this purpose, should be varied as much as possible; and here we may be allowed to indulge a greater latitude in regard to their different heights, from low shrubs to trees of considerable loftiness.

With respect to the disposition of the kinds, the deciduous and ever-greens may be planted in separate compartments, or in mixtures; although the tree-kinds are occasionally planted by themselves; the plantations in their line of running being often varied towards the boundaries of lawns, parks, paddocks, &c.; and often disposed in avenues, groves, thickets, and clumps, differently arranged in different parts; and hence, at times, forming shrubberies, wildernesses, shady walks, and wood-walks; those of taller growth being placed backward, and those of lower in front; the whole being bordered with beautiful flowering shrubs, and showy ever-greens, especially next the principal walks and lawns; and the form of the several compartments being also varied by moderate sweeps and curves outward and inward, of different dimensions, by easy bends, or abrupt breaks and projections, so as to diversify the scene as much as possible in imitation of the plantations of nature. The proper distances in planting may be from five or ten to fifteen or twenty feet: in continued and ornamental plantation where required to be close for a dark thick shade, from ten to fifteen, and where glades or an intermixture of light is demanded, from fifteen to twenty; and in thickets where the shade sought for is impenetrably deep and massy, they are often planted not farther than five or six feet from each other. Where clumps are aimed at, the form should be occasionally varied from triangular to quadrangular, curved, or even rectilinear: and in wildernesses the quincunx may sometimes be introduced as a pleasing diversity.

In the formation of plantations for woods or forests, for the purpose of reaping advantage of the future timber, the best kinds, both of deciduous and ever-greens, are perhaps the oak, elm, ash, beech, chesnut, horn-beam, birch, alder, maple, sycamore, plane, poplar, lime, walnut, wild-cherry, mountain-ash, larch, willow, hazel, all which are deciduous; among the ever-greens, pine, fir, cedar of Lebanon, holly, bay, laurel, yew, ever-green oak, and box-tree.

These are sometimes raised from seeds in the spots in which they are designed to continue, but more generally in nurseries. The first is accompanied with less trouble in the rearing, but for many years afterwards demands great care and attention. The last gives us the trouble and expence of transplantation, but when this is completed the whole of the trouble and expence is at an end.

The preparation of the ground for the final

reception of the seeds or plants is mostly performed by deep ploughing and harrowing where the plough can be made use of; but where this or other tillage is impracticable only young plants from the nursery can be used, holes being dug at proper distances for the reception of each. The most proper season for performing this sort of planting, whether by seeds or plants, is dry mild weather in the autumn or winter, as from October to February, and still later if the soil be moist; when large tracts are to be planted both the seed and plant methods must be pursued all the winter at every favourable opportunity.

The grounds should be well fenced in all round with a deep ditch to guard against the encroachment of cattle or other animals: after which, the weeds should be occasionally destroyed by common hoeing, or where it can be accomplished by horse hoeing. After the third year this trouble however may be spared, and no other labour be requisite till the trees are ready for the first fall or thinning for the purpose of poles or faggots.

PLANTED. *participle.* (from *plant*.) This word seems in *Shakspeare* to signify settled; well grounded.

PLANTER. *s.* (*planteur*, French.) 1. One who sows, sets, or cultivates; cultivator (*Dryden*). 2. One who cultivates ground in the West Indian colonies (*Locke*). 3. One who disseminates or introduces (*Addison*).

PLANTERSHIP, in a general sense, the business of a planter.

PLANTERSHIP, in the West Indies, denotes the management of a sugar plantation, including not only the cultivation of the cane, but the various processes for the extraction of the sugar, together with the making of sugar-spirits. See *RUM*, *SACCHARUM*, and *SUGAR*.

PLANTING, the operation of inserting plants, seeds, and roots into the earth for the purpose of vegetation and future growth. Hence this operation is differently performed according to the nature of the material to be planted. The chief methods are as follows—hole-planting; trench-planting; slit or crevice-planting; holing-in planting; drill-planting; bedding-in planting; furrow-planting; dibble-planting; trowel-planting; planting with balls of earth round the roots; planting in pots.

Of these, however, the first is the chief and most important method, and that to which the term is often applied without any explanatory epithet or distinction. It consists in setting a tree or plant, taken from its proper place, in a new hole or pit; throwing fresh earth over its root, and filling up the hole to the level of the surface of the ground.

The first thing in this kind of planting is to prepare the ground before the trees or plants are taken out of the earth, that they may remain out of the ground as short a time as possible; and the next is, to take up the trees or plants, in order to their being transplanted. In taking up the trees, carefully dig away the earth round the roots, so as to come at their several parts to cut them off; for, if they are

torn out of the ground without care, the roots will be broken and bruised, to the great injury of the trees. When you have taken them up, the next thing is to prepare them for planting by pruning the roots and heads. And first, as to the roots; all the small fibres are to be cut off, as near to the place from whence they are produced as may be, except they are to be replanted immediately after they are taken up. Then prune off all the bruised or broken roots, all such as are irregular and cross each other, and all downright roots, especially in fruit-trees: shorten the larger roots in proportion to the age, the strength, and nature of the tree; observing that the walnut, mulberry, and some other tender-rooted kinds should not be pruned so close as the more hardy sorts of fruit and forest trees: in young fruit-trees, such as pears, apples, plums, peaches, &c. that are one year old from the time of their budding or grafting, the roots may be left only about eight or nine inches long; but in older trees, they must be left of a much greater length: but this is only to be understood of the larger roots; for the small ones must be chiefly cut quite out, or pruned very short. The next thing is the pruning of their heads, which must be differently performed in different trees; and the design of the trees must also be considered. Thus, if they are designed for walls or espaliers, it is best to plant them with the greatest part of their heads, which should remain on till they begin to shoot in the spring, when they must be cut down to five or six eyes, at the same time taking care not to disturb the roots. But if the trees are designed for standards, you should prune off all the small branches close to the place where they are produced, as also the irregular ones which cross each other; and, after having displaced these branches, you should also cut off all such parts of branches as have by any accident been broken or wounded; but by no means cut off the main leading shoots, which are necessary to attract the sap from the root, and thereby promote the growth of the tree. Having thus prepared the trees for planting, you must now proceed to place them in the earth: but first, if the trees have been long out of the ground, so that the fibres of the roots are dried, place them eight or ten hours in water before they are planted, with their heads erect, and the roots only immersed therein; which will swell the dried vessels of the roots, and prepare them to imbibe nourishment from the earth. In planting them, great regard should be had to the nature of the soil: for, if that be cold and moist, the trees should be planted very shallow; and if it be a hard rock or gravel, it will be better to raise a hill of earth where each tree is to be planted, than to dig into the rock or gravel, and fill it up with earth, as is too often practised, by which means the trees are planted as it were in a tub, and have but little room to extend their roots. The next thing to be observed is, to place the trees in the hole in such a manner that the roots may be about the same depth in the ground as before they were taken up; then break the

PLANTING.

earth fine with a spade, and scatter it into the hole, so that it may fall in between every root, that there may be no hollowness in the earth : then having filled up the hole, gently tread down the earth with your feet, but do not make it too hard ; which is a great fault, especially if the ground be strong or wet. Having thus planted the trees, they should be fastened to stakes driven into the ground to prevent their being displaced by the wind, and some mulch laid upon the surface of the ground about their roots : as to such as are planted against walls, their roots should be placed about five or six inches from the wall, to which their heads should be nailed to prevent their being blown up by the wind. The seasons for planting are various, according to the different sorts of trees, or the soil in which they are planted. For the trees whose leaves fall off in winter, the best time is the beginning of October, provided the soil be dry ; but if it be a very wet soil, it is better to defer it till the latter end of February, or the beginning of March ; and for many kinds of evergreens, the beginning of April is by far the best season ; though they may be safely removed at midsummer, provided they are not to be carried very far ; but we should always make choice of a cloudy wet season.

In the second volume of the papers, &c. of the Bath Society there is a letter on planting waste grounds. The gentleman who writes it informs us, that in the county of Norfolk, where he resides, there were about 60 or 70 years ago vast tracts of uncultivated ground, which were then thought totally barren. "The western parts of it (says he) abounded with sands of so light a texture, that they were carried about by every wind ; and in many places the sands were so loose that no grass could grow upon them. Art and industry, however, have now so altered the face of this once Arabian desert, that it wears a very different appearance. Most of these tracts are either planted, or rendered very good corn-land and sheep-walks.

"About 30 years since, the sides of many of our little sand-hills were sown with the seeds of French furze ; and when a wet season followed, they succeeded very well, and grew so fast, that once in three or four years they were cut for fuel, and sold at a good price at Thetford, Brandon, Harling, Swaffham, and places adjacent. This excited some public-spirited gentlemen, among whom was the late Mr. Buxton of Shadwell-Lodge, near Thetford, to attempt the planting of Scotch and spruce firs, and other hardy forest trees. At first they found some difficulty from the extreme looseness of the sand. But as there is in all this part of the country fine white and yellow marl, at about three feet depth below the sand, they very judiciously thought that incorporating it with the sand in the holes where their young trees were planted would insure success ; nor were they disappointed. The method succeeded beyond expectation ; the plantations throve exceedingly, and the roots

soon reached below the sand, after which they were out of danger. This excited them to further attempts.

"On the spots where they intended to raise new plantations from seeds and acorns, they laid on a thick coat of marl and clay, which, after being rough spread, and lying a winter in that state, was made fine, and ploughed in just before planting. By these means the soil became fixed, and in a little time covered with grass and herbage ; so that there are now vast plantations of firs, oak, and forest-trees, in the most healthy and vigorous state, where within my memory ten acres of land would not maintain a single sheep three months.

"But the benefit of plantations, whether of shrubs, copse, or trees, is not confined to the immediate advantage, or even the future value of the wood. By annually shedding a great number of leaves, which the winds disperse, and the rains wash into the soil, it is considerably improved ; and whenever such copses have been stubbed up, the ground (however unfruitful before planting) has thereby been so enriched as to bear excellent crops for many years, without the additional help of manure. How much land-owners are interested in planting waste or barren spots I need not mention ; and nothing but a degree of indolence or ignorance unpardonable in this enlightened age could induce them to neglect it.

"Nature has furnished us with plants, trees, and shrubs, adapted to almost every soil and situation ; and as the laws of vegetation are now much better understood than formerly, it is a reproach to those whose practice does not keep pace with their knowledge in making the best use of her bounty. Let no man repine, and say the land is barren ; for those spots which appear to be so, owe that appearance to human negligence. Industry and art might soon render an eighth part of this kingdom nearly as valuable as the rest, which now remains in a state unprofitable to the owners, and disgraceful to the community."

PLANTING (Reverse), a method of planting, in which the natural position of the plant or shoot is inverted ; the branches being set into the earth, and the root reared into the air. Dr. Agricola mentions this monstrous method of planting, which he found to succeed very well in most or all sorts of fruit-trees, timber-trees, &c. Bradley affirms, that he has seen a lime-tree in Holland growing with its first roots in the air, which had shot out branches in great plenty, at the same time that its first branches produced roots and fed the tree. Mr. Fairchild of Hoxton has practised the same with success, and gives the following directions for performing it : make choice of a young tree of one shoot, of alder, elm, willow, or any other tree that easily takes root by laying ; bend the shoot gently down into the earth, and so let it remain until it has taken root. Then dig about the first root, and raise it gently out of the ground, till the stem be nearly upright, and stake it up. Then prune the roots, now erected in the air, from the

bruises and wounds they received in being dug up; and anoint the pruned parts with a composition of two ounces of turpentine, four ounces of tallow, and four ounces of bees wax, melted together, and applied pretty warm. Afterwards prune off all the buds or shoots that are upon the stem, and dress the wounds with the same composition, to prevent any collateral shootings, that might spoil the beauty of the stem.

PLANUM OS. (*planus*, soft, smooth; applied to a bone whose surface is smooth or flat.) The papyraceous or orbital portion of the ethmoid bone was formerly so called.

PLASHING, a term used by farmers to express an operation performed at certain times upon their quickset-hedges, in order to assist their growth and continuance. This operation is performed sometimes in October, but more usually in February; and this is by much the better season for it. Suppose a hedge to be of twenty or thirty years growth, and full of old stubs as well as young shoots, this is the kind of hedge that requires plashing most of all. The old stubs must be cut off within two or three inches of the ground, and the best and longest of the middle sized shoots must be left to lay down. Some of the strongest of these must also be left to answer the purpose of stakes. These are to be cut off to the height at which the hedge is intended to be left; and they are to stand at ten feet distance one from another: when there are not proper shoots for these at the due distances, their places must be supplied with common stakes of dead wood. The hedge is to be first thinned, by cutting away all those shoots which are intended to be used either as stakes, or the other work of the plashing: the ditch is to be cleaned out with the spade: the ditch must be now dug as at first, with sloping sides each way; and when there is any cavity on the bank on which the hedge grows, or the earth has been washed away from the roots of the shrubs, it is to be made good by facing it, as they express it, with the mould dug from the upper part of the ditch; all the rest of the earth dug out of the ditch is to be laid upon the top of the bank, and the owner should look carefully into it that this be done; for the workmen, to spare themselves trouble, are apt to throw as much as they can upon the face of the bank; which being by this means overloaded, is soon washed off into the ditch again, and a very great part of the work undone again, whereas what is laid on the top of the bank always remains there, and makes a good fence of an indifferent hedge. In the plashing the quick, two extremes are to be avoided; these are, laying it too low, and laying it too thick: the former makes the sap run all into the shoots, and leaves the plashes without sufficient nourishment; which, with the thickness of the hedge, finally kills them. The other extreme of laying them too high, is equally to be avoided; for this carries up all the nourishment into the plashes, and so makes the shoots small and weak at the bottom, and consequently the hedge thin.

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This is a common error in the north of England. The best hedges made any where in England, are those of Hertfordshire; and they are plashed in a middle way between the two extremes, and the cattle are by that prevented both from cropping the young shoots, and from going through; and a new and vigorous hedge soon forms itself. A new hedge raised from sets in the common way generally requires plashing about eight or nine years after.

PLASH. *s.* (*plasche*, Dutch.) 1. A small lake of water; a puddle (*Bacon*). 2. (from the verb.) Branch partly cut off and bound to other branches (*Mortimer*).

To PLASH. *v. a.* (*plesset*, Fr.) To interweave branches (*Evelyn*).

PLASHY. *a.* (from *plash*.) Watery; filled with puddles (*Bellerton*).

PLASM. *s.* (*πλασμα*) A mould; a matrix in which any thing is cast or formed (*Woodward*).

PLASMA, in mineralogy, a mineral of the nature of chalcedony, and by Gmelin arranged as one of its species. It is of a green colour of various shades, mixed with brown, and the whole arranged in dots, clouds, and bands. It occurs in mass, and in angular and rounded fragments inclosed in talc or steatite. It has a feeble, greasy lustre, both internally and externally. Its fracture is conchoidal passing to fine splintery. Its fragments are indeterminate and sharp-edged. It is translucent, and in thin pieces semi-transparent: its hardness is nearly equal to that of chalcedony: it is brittle, and easily fragile.

Its proper geological situation has not as yet been ascertained; neither has it been submitted to chemical analysis. It is not uncommon in Italy and the Levant: it occurs near Bojanovik, in Moravia, imbedded in serpentine, and near Toeltsva, in Upper Hungary, in rounded pieces with hornstone. Sometimes it combines with heliotrope and chalcedony, forming agate.

PLASSEY (Plains of), in Bengal, about 30 miles from Moorsshedabad, and 70 from Calcutta. This spot is memorable for a great victory obtained by colonel Clive, in 1757, over the nabob Surajah Dowlah; by which was laid the foundation of the present extensive British empire in Hindustan.

PLASTER. *s.* (*plastre*, Fr. from *πλάζω*.) 1. Substance made of water and some absorbent matter, such as chalk or lime well pulverized, with which walls are overlaid, or figures cast (*Pope*). 2. (*emplastrum*, Latin; in English, formerly *emplaster*.) A glutinous or adhesive salve (*Shakspeare*).

To PLASTER. *v. a.* (*plastrer*, Fr. from the noun.) 1. To overlay as with plaster (*Bacon*). 2. To cover with a medicated plaster.

PLASTER OF PARIS, in mineralogy. See GYPSUM.

PLASTERER. *s.* (*plastrier*, Fr.) 1. One whose trade is to overlay walls with plaster (*Shakspeare*). 2. One who forms figures in plaster (*Wotton*).

PLASTIC, *πλαστικός*, from *πλάσσειν*, of *πλάττω*,
F F

PLASTIC NATURE.

or *πλαστικός*, *fingo*, I fashion, form, &c. imports as much as *formative*, or a thing endued with a faculty of forming or fashioning a mass of matter after the likeness of a living being.

PLASTIC NATURE, a certain power by which, as an instrument, many philosophers, both ancient and modern, have supposed the great motions in the corporeal world, and the various processes of generation and corruption, to be perpetually carried on.

Among the philosophers of Greece, such a power was almost universally admitted. It seems, indeed, to have been rejected only by the followers of Democritus and Epicurus, who talk as if they had thought gravity essential to matter, and the fortuitous motion of atoms, which they held to have been from eternity, the source not only of all the regular motions in the universe, but also of the organization of all corporeal systems, and even of sensation and intellection, in brutes and in men. It is needless to say, that those men, whatever they might profess, were in reality atheists; and Democritus, it is universally known, avowed his atheism.

The greater part of the philosophers who held the existence of a plastic nature, considered it not as an agent in the strict sense of the word, but merely as an instrument in the hand of the Deity; though even among them there were some who held no superior power, and were of course as gross atheists as Democritus himself. Such, was Strato of Lampsacus. This man was originally of the peripatetic school, over which he presided many years, with no small degree of reputation for learning and eloquence. He was the first and chief assertor of what has been termed Hylozoic atheism; a system which admits of no power superior to a certain natural or plastic life, essential, ingenerable, and incorruptible, inherent in matter, but without sense and consciousness. That such was his doctrine we learn from Cicero, who makes Velleius the Epicurean say, "*Nec audiendus Strato qui Physicus appellatur, qui omnem vim divinam in Natura sitam esse censet, quæ causas gignendi, augendi, minuendive habeat, sed careat omni sensu.*" That Strato, in admitting this plastic principle, differed widely from Democritus, is apparent from the following account of him by the same author: "*Strato Lampsacenus negat opera deorum se uti ad fabricandum mundum, quæcunque sint docet omnia esse effecta naturæ, nec ut ille, qui asperis, et levibus, et hamatis uncinatisque corporibus concreta hæc esse dicat, interjecto inani; somnia censet hæc esse Democriti, non docentis sed optantis.*"

That the rough and smooth, and hooked and crooked, atoms of Democritus were indeed dreams and dotages, is a position which no man will controvert; but surely Strato was himself as great a dreamer when he made sensation and intelligence result from a certain plastic or spermatie life in matter, which is itself devoid of sense and consciousness. It is, indeed, inconceivable, to use the emphatic

language of Cudworth, "how any one in his senses should admit such a monstrous paradox as this, that every atom of dust has in itself as much wisdom as the greatest politician and most profound philosopher, and yet is neither conscious nor intelligent!" It is to be observed of Strato likewise, that though he attributed a certain kind of life to matter, he by no means allowed of one common life as ruling over the whole material universe. He supposed the several parts of matter to have so many several plastic lives of their own, and seems to have attributed something to chance in the production and preservation of the mundane system.

In denying the existence of a God, perpetually directing his plastic principle, and in supposing as many of these principles as there are atoms of matter, Strato deviated far from the doctrine of Aristotle. The great founder of the peripatetic school, as well as his apostate disciple, taught that mundane things are not effected by fortuitous mechanism, but by such a nature as acts regularly and artificially for ends; yet he never considers this nature as the highest principle, or supreme Numen, but as subordinate to a perfect mind or intellect; and he expressly affirms, that "mind, together with nature, formed or fashioned this universe." He evidently considers mind as the principal and intelligent agent, and nature as the subservient and executive instrument. Indeed, we are strongly inclined to adopt the opinion of the learned Mosheim, who thinks that by nature Aristotle meant nothing more than that *θερμότης φυσική*, or animal heat, to which he attributes immortality, and of which he expressly says that all things are full. Be this as it may, he always joins God and nature together, and affirms that they do nothing in vain. The same doctrine was taught before him by Plato, who affirms that "nature, together with reason, and according to it, orders all things." It must not, however, be concealed, that Plato seems to have attributed intelligence to the principle by which he supposed the world to be animated; for Chalcidius, commenting on the *Timæus*, thus expresses himself: "*Hæc est illa rationabilis anima mundi, quæ gemina juxta meliorem naturam veneratione tutelam præbet inferioribus, divinis dispositionibus obsequens, providentiam nativis impertiens, æternorum similitudine propter cognationem beata.*" Apuleius, too, tells us, "*Illam cœlestem animam, fontem animarum omnium, optimam virtutem esse genericam, subserviri etiam Fabricatori Deo, et præsto esse ad omnia inventa ejus.*" Plato pronouncieth.

This doctrine of Plato has been adopted by many moderns of great eminence both for genius and for learning. The celebrated Berkeley, bishop of Cloyne, after giving the view of Plato's *anima mundi*, which the reader will find in our article *MOTION*, thus recommends the study of his philosophy: "If that philosopher himself was not read only, but studied also with care, and made his own interpreter, I believe the prejudice that now lies against him would soon wear off, or be even

Converted into high esteem, for those exalted notions, and fine hints, that sparkle and shine throughout his writings : which seem to contain not only the most valuable learning of Athens and Greece, but also a treasure of the most remote traditions and early science of the east." Cudworth, and the learned author of *Ancient Metaphysics*, are likewise strenuous advocates for the Aristotelian doctrine of a plastic nature diffused through the material world.

PLASTIC ART, the art of representing all sorts of figures by the means of moulds.

PLASTRON, *s.* (Fr.) A piece of leather stuffed, which fencers use, when they teach their scholars, in order to receive the pushes made at them (*Dryden*).

To **PLAT**, *v. a.* (from *plait*.) To weave; to make by texture (*Addison*).

PLAT, *s.* (more properly *plot*; *plot*, Sax.) A small piece of ground (*Milton*).

PLATA, an island of Peru, on the coast of Quito, surrounded by inaccessible rocks, and about five miles long and four broad.

PLATA, a rich and populous town of Peru, capital of the audience of Los Charcos, with an archbishop's see. It is seated on the Chimao, 500 miles S.E. of Cusco. Lon. 63. 40 W. Lat. 19. 16 S.

PLATA, or **RIO-DE-LA-PLATA**, a large river of S. America, formed by the union of the three great rivers Paraguay, Uruguay, and Parana. It was discovered, in 1517, by Juan Diaz de Solis, a Spanish navigator, who was slain by the natives, in endeavouring to make a descent in the country. It crosses Paraguay, and enters the Atlantic Ocean, in lat. 35° S. It is 150 miles broad at its mouth; at Mont Video, a fort, above 100 miles up the river, the land is not to be discerned on either shore, when a vessel is in the middle of the channel; and at Buenos Ayres, 200 miles higher, the opposite shore is not to be discerned from that town.

PLATA (Rio-de-la), a province of Paraguay, on the S.W. of a river of the same name. It is subject to Spain, and at Buenos Ayres, the capital, a new vice-royalty was established in 1776. See **PERU**.

PLATÆA, an island on the coast of Africa, in the Mediterranean. It belonged to the Cyreneans.

PLATÆÆ, (*arum*), a town of Bœotia, on the confines of Megaris and Attica, celebrated for a battle fought there between Mardonius, the commander of Xerxes, king of Persia, and Pausanias the Lacedæmonian, and the Athenians. The Persian army consisted of 300,000 men, 3000 of which scarce escaped with their lives by flight. The Grecian army, which was greatly inferior, lost but few men, and among these 91 Spartans, 52 Athenians, and 16 Tegeans, were the only soldiers found in the number of the slain. This battle was fought on the 22d of September, the same day as the battle of Mycale, 479 B. C. and by it Greece was totally delivered from the alarms of the Persian invasions. **Platæa** was taken

by the Thebans, after a famous siege, in the beginning of the Peloponnesian war, and destroyed by the Spartans, B. C. 427. Alexander afterwards rebuilt it.

PLATALEA. Spoonbill. In zoology, a genus of the class aves, order grallæ. Bill long, thin; the tip dilated, orbicular, flat; nostrils small, at the base of the bill; tongue short, pointed; feet four-toed, semipalmate. Three species.

1. *P. leucorodia*. White spoonbill. Of this species there are three varieties.

a. Body white; chin black; hind-head sub-crested.

6. Wings varied with black and white; legs yellowish.

γ. Body all white; legs flesh-colour. The bill black, brown, or spotted; tongue heart-shaped; irids grey; lores, orbits, and naked, dilatable chin, black; quill-feathers sometimes tipped with black; legs black. Inhabits Europe and Asia; two feet eight inches long; feeds on fishes, frogs, snakes, and grass; builds in high trees; lays from three to four white eggs, powdered with reddish spots; flesh resembles that of a goose, especially when young.

2. *P. ajaja*. Roseat spoonbill. Body rosy; tail-coverts scarlet. Another variety blood-red; neck white; collar black; tail-feathers scarlet. Inhabits South America; two feet three inches long.

3. *P. pygmæa*. Dwarf spoonbill. Body above brown, beneath white; bill black, longer than the head, nearly rhomboid at the tip; the angles and tip of the upper mandible white; shafts of the quill-feathers white; tail short, rounded; feet cleft.

This family of birds has obtained its name from the broad, flat, and thin structure of the bill, which widens, towards the end, into a circular form, resembling a spoon. This instrument, so singular in structure, is equally so in regard to the substance of which it is composed; for it is not hard like the beak of other birds, but soft and flexible like leather. It is seven inches in length, and near two in breadth, towards the point. All round the upper mandible runs a rim, which covers the lower one. In the European species both mandibles are black, and sometimes grey; but the beak of the American spoonbill is of a red colour, resembling its feathers. These birds are nearly of the size of an heron. Their neck and legs, however, are much shorter, which gives them a smaller appearance: for, while the heron is four feet high, the spoonbills are not more than three. The European species is covered with white plumage, except on the throat and upper part of the neck, which are naked. Behind the head, there are a few long straight feathers, which form a kind of hanging crest. The two American kinds are smaller: the one is of a rose colour, and the other of a deep crimson red. The rose-coloured spoonbills inhabit Guiana and Brasil; the crimson-coloured, Mexico and Jamaica. On the American continent, these birds are generally adorned

with more lively tints, and greater brilliancy of colouring, than on the continents of the Old World. Here, however, the clumsy figure of the animal, upon which these are lavished, destroys their effects; for, with so strange a beak, and so grotesque a visage, the glaring feathers of the spoonbill seem only to add splendor to deformity.

All the different species belonging to this tribe inhabit the sea-coasts; their residence in mediterranean regions, on the borders of lakes and rivers, being only temporary; and, probably, when they are travelling from one district to another. They are spread extensively along the shores in most parts of Europe and America. Some places are famed for the vast flocks of these birds, such as the marsh, in the neighbourhood of Leyden, called Sevenhuis. Thither they crowd in great numbers, and breed in company with the herons, cormorants, and other aquatic birds of the same order, which seem to have chosen this spot for their general rendezvous.

Spoonbills construct their nests of twigs upon the summit of tall trees; generally near the sea-coast. During the season of nidification, they are extremely vociferous: at other times, they only return in the evening to sleep in the forest. The brood consists of three or four young, which are fed with aquatic insects, worms, or fishes, which constitute the subsistence of the greater part of the grallæ or waders. Spoonbills are far from being so shy as most of the aquatic tribes; whether in the water or when perched, they allow the sportsman to approach within gunshot. See Nat. Hist. Pl. CLXIX.

PLATANUS. Plane-tree. In botany, a genus of the class monocæia, order polyandria. Male: calyx a globular ament; corol hardly visible; anthers growing round the filament. Female: a globular ament; corol many petalled; stigma recurved; seed rounded, mucronate, with a capillary down at the base. Two species.

1. *P. orientalis.* Oriental plane-tree. Leaves somewhat palmate, the nerves nearly glabrous underneath: stem tall, erect, covered with a smooth bark, in the younger branches dark brown inclining to a purple; branches long, numerous, crooked at their joints; flowers upon long peduncles hanging downwards, each peduncle containing five or six balls of flowers. The flowers are so small as to be scarcely distinguished without glasses; they appear in the beginning of June a little before the leaves; the seeds ripen late in autumn, and if left upon the trees will remain till spring, when the balls fall to pieces, and the bristly down which surrounds the seeds helps to transport them to a great distance with the wind. A native of Asia, and flourishes extensively in the Levant. There are three varieties of this species.

2. Spanish plane-tree. Leaves tapering to the base, flat.

3. Middle plane-tree; leaves tapering to the base, waved.

4. Maple plane-tree. Leaves transverse.

2. *P. occidentalis.* Western or occidental plane-tree. Leaves lobe-angular; the nerves downy underneath. Stem very straight, of equal girth most part of its length; bark smooth, which the plant has the singular property of exfoliating annually; branches numerous and wide on every side; flowers still smaller than those of the former species, round balls; appear at the same time as in the former.

Both species are elegant and hardy, will bear the open plantations of our own country, and have a very ornamental effect. They may be increased by seeds, layers, or cuttings; the last two modes are the most common.

PLATBAND, in gardening, a border or bed of flowers, along a wall, or the side of a parterre, frequently edged with box, &c.

PLATBAND of a door or window, is used for the lintel, where that is made square, or not much marked.

PLATE. *s.* (plate, Dutch; plaque, Fr.)

1. A piece of metal beat out into breadth (*Shakspeare*). 2. Armour of plates (*Spenser*). 3. (plata, Spanish.) Wrought silver (*King*). 4. (plat, Fr. platta, Ital.) A small shallow vessel of metal on which meat is eaten (*Dryden*).

To PLATE. *v. a.* (from the noun.) 1. To cover with plates (*Sandys*). 2. To arm with plates (*Shakspeare*). 3. To beat into laminae or plates (*Newton*).

PLATE, in heraldry, is a round flat piece of silver, without any impression, but as it were formed ready to receive it.

PLATE is also a term used by our sportsmen, to express the reward given to the best horse at our races.

PLATES, in gunnery. The prise-plates are two plates of iron on the cheeks of a gun-carriage, from the cape square to the centre, through which the prise-bolts go, and on which the handspike rests when it poises upon the breech of the piece. Breast-plates are the two plates on the face of the carriage, one on each cheek. Train-plates are the two plates on the cheeks, at the train of the carriage. Dulidge-plates are the six plates on the wheel of a gun-carriage, where the felloes are joined together, and serve to strengthen the dulidges.

PLATED SPAR. See **SCHISTUSPATHUM.**

PLATE-LONG, in farriery, a woven strap four fathoms long, as broad as three fingers, and as thick as one, formerly made use of in the manage for raising a horse's legs, and sometimes for throwing him down, in order to facilitate the operations of the farrier.

PLATEN. *s.* Among printers, the flat part of the press whereby the impression is made.

PLAT'FORM. *s.* (plat, flat, French, and form.) 1. The sketch of any thing horizontally delineated; the ichnography (*Sandys*). 2. A place laid out after any model (*Pope*). 3. A level place before a fortification (*Shakspeare*). 4. A scheme; a plan (*Woodward*).

PLATFORM, in the military art, an elevation of earth, on which cannon is placed, to fire on the enemy; such are the mounts in the middle of curtains. On the rampart there is always a platform, where the cannon are mounted. It is made by the heaping up of earth on the rampart, or by an arrangement of madriers, rising insensibly, for the cannon to roll on, either in a casemate, or on attack in the out-works.

All practitioners are agreed, that no shot can be depended on, unless the piece can be placed on a solid platform; for if the platform shakes with the first impulse of the powder, the piece must likewise shake, which will alter its direction, and render the shot uncertain.

PLATFORM, in architecture, is a row of beams, which support the timber-work of a roof, and lie on the top of the wall, where the entablature ought to be raised. This term is also used for a kind of terrace, or broad, smooth, open walk at the top of a building, from whence a fair prospect may be taken of the adjacent country. Hence an edifice is said to be covered with a platform, when it is flat at top, and has no ridge. Most of the oriental buildings are thus covered, as were all those of the ancients.

PLATFORM, or ORLOP, in a man of war, a place on the lower deck, abaft the main-mast, between it and the cockpit, and round about the main capstan, where provision is made for the wounded men in time of action.

PLATIC ASPECT, in astrology, is a ray cast from one planet to another, not exactly, but within the orbit of its own light (*Bailey*).

PLATINA (*Bartholemia Sacchi*), born in 1421, near Mantua, author of a History of the Popes. He was appointed apostolical abbreviator under Pius II. but Paul II. removed him and all the other abbreviators from their employment. Sixtus IV. made him librarian of the Vatican, in which employment he died of the plague in 1481. He wrote several other books besides his History of the Popes.

PLATINA. See **PLATINUM**.

PLATINUM. *Platina*. In mineralogy, a genus of the class metals, deriving its name from the Spanish word *plata* or silver, in consequence of its external resemblance to it, or from the river Plata, in Spanish America, near which it is found. It is characterized by a silvery colour not tarnished by the air, very hard and tenacious, sonorous, exceedingly malleable and ductile, specific gravity 23,000; not fusible in any degree of heat, but detonating with nitre; soluble only by boiling it in sixteen times its weight of nitro-muriatic acid, and giving the solution first a yellow and then a red-brown colour; its oxyd is precipitated from this solution by the addition of muriat of ammonia, in the form of an orange powder. Found near Quito in Peru, near Santa Fe in New Granada, and near the village Choco, in mines, or mixed with sand on the banks of rivers, always in the form of small, smooth, compressed grains of the colour of polished tin, it is always combined with iron or some other metallic substance, sometimes amounting to an eighth part, which may be readily separated from it by dissolving it in muriatic acid: the heaviest and most refractory of all metals, and requires a very vehem-

ment degree of heat to render it liquid. Its tenacity is such that a wire of it 0.078 of an inch in diameter is capable of supporting a weight of 27,431 pounds averdupoise without breaking. It is easily melted by a flux of powdered glass, borax, and charcoal; and is frequently magnetic, from the quantity of iron it contains. In consequence of its great malleability, ductility, tenacity, durability, and insolubility, it is a very precious metal.

The precipitate of this metal obtained by its solution in nitro-muriatic acid, and which was at first conceived to be entirely oxyd of iron, and afterwards to be plumbago, has since been found to consist of ores of four new metals which have never been found otherwise than in this precipitate, or ore of platina. These metals are

- | | |
|-------------|---------------|
| 1. Osmium. | 3. Rhodium. |
| 2. Iridium. | 4. Palladium. |

Platinum was first brought into Europe in 1749, by Mr. Charles Wood, a paymaster of Jamaica; and in the succeeding year specimens were presented by Dr. Brownrigg to the Royal Society. These came from Carthage; from which place also were dispersed, through the Spanish West Indies, various toys and trinkets consisting of this metal alloyed with some other, probably silver, as the price of the alloy was nearly equal to that of this latter metal.

Mr. Wood and Lewes began the investigation of the properties of this new substance in the very year in which it was imported: it has since employed the abilities of all the most eminent chemists of all countries; but many difficulties still remain to be overcome before the chemical history of this substance can be completed.

Crude platinum comes from America in small flat grains of a silvery lustre. In this state it is exceedingly impure, containing, either chemically mixed, or chemically united, no less than nine other metals: but it may be reduced nearly to a state of purity by the following process.—Decant the solution from the black matter which resists the action of the acid; drop into it a solution of sal-ammoniac, an orange yellow-coloured precipitate falls to the bottom; wash this precipitate, and when dry expose it to a heat slowly raised to redness in a porcelain crucible. The powder which remains is platinum nearly pure. By re-dissolving it in nitro-muriatic acid, and repeating the whole process, it may be made still purer. When these grains are wrapped up in a thin plate of platinum heated to redness, and cautiously hammered, they unite, and the whole may be formed into an ingot.

Platinum thus obtained is of a white colour like silver, but not so bright. It has no taste nor smell. Its hardness is 8; its specific gravity, after being hammered, 23,000, so that it is by far the heaviest body known. Its ductility and tenacity we have already noticed. It is one of the most infusible of all the metals, and cannot be melted, in any quantity at least, by the strongest artificial heat which can be produced. Macquer and Beaumé melted small particles of it by means of a blowpipe, and Lavoisier by exposing them on red-hot charcoal to a stream of oxygen gass. It may indeed be melted without difficulty when combined or mixed with other bodies, but then it is not in a state of purity. Pieces of platinum, when heated to whiteness, may be welded together by hammering in the same manner as hot iron.

This metal is not in the smallest degree altered by the action of air or water.

It cannot be combined with oxygen and converted into an oxyd by the strongest artificial heat of

PLATINUM.

our furnaces. Platinum, indeed, in the state in which it is brought from America may be partially oxydized by exposure to a violent heat, as numerous experiments have proved; but in that state it is not pure, but combined with a quantity of iron. It cannot be doubted, however, that if we could subject it to a sufficient heat, platinum would burn and be oxydized like other metals; for when exposed to a very violent action of electricity, or voltaism, it has been reduced in small quantities to an oxyd form.

To obtain therefore the oxyds of this metal to any extent, it is necessary to have recourse to the action of an acid. When the deep-brown solution of platinum in nitro-muriatic acid is treated with lime-water, a yellowish brown powder falls. Dissolve this powder in nitric acid; evaporate to dryness, and apply a heat sufficient to drive off the acid. The brown powder which remains is the peroxyd of platinum. It is tasteless, and insoluble in water. When heated to redness, the oxygen is driven off, and the oxyd reduced to the metallic state. One hundred and fifteen parts of oxyd by this treatment leave 100 parts of metal. Hence the oxyd is composed of

87 platinum
13 oxygen
—
100

If the heat in this experiment be very cautiously raised, the oxyd, before it is reduced, assumes a green colour. This change is occasioned by the separation of a portion of the oxygen. The green-coloured powder is, according to Chevenix, a protoxyd of platinum. From his experiments we learn that it is composed of

93 platinum
7 oxygen
—
100

The action of the simple combustibles on this metal is not more remarkable than their action on gold.

Neither hydrogen nor carbon have been hitherto combined with it.

Phosphorus unites without difficulty, and forms a phosphuret. By mixing together an ounce of platinum, an ounce of phosphoric glass, and a drachm of powdered charcoal, and applying a heat about 320 Wedgewood, Mr. Pelletier formed phosphuret weighing more than an ounce. It was partly in the form of a button, and partly in cubic crystals. It was covered above by a blackish glass, of a silver-white colour, very brittle, and hard enough to strike fire with steel. When exposed to a fire strong enough to melt it, the phosphorus was disengaged and burnt on the surface. He found also that when phosphorus was projected on red-hot platinum, the metal instantly fused and formed a sulphuret. As heat expels the phosphorus, M. Pelletier has proposed this as an easy method of purifying platinum.

Platinum cannot be made to unite to sulphur by heating them together. In this respect it resembles gold, yet there seems to be an affinity between the two substances; for when the metal is heated with a mixture of potash and sulphur it is corroded and rendered partly soluble in water, as was proved by the experiments of Lewis and Marcgraff. And when sulphuretted hydrogen gas is passed into a solution of platinum in an acid, the metal is thrown down in dark-brown flakes, apparently in combination with sulphur.

Platinum, as far as it is known, does not combine with the simple combustibles.

It combines with most of the metals, and forms alloys; one of the most useful, as it may hereafter perhaps be found, is that with iron, since it is found to preserve the iron from rusting or oxydizing in the open air, and does not destroy its malleability.

Dr. Lewis found that gold united to platinum when they were melted together in a strong heat. He employed only crude platinum: but Vauquelin, Hatchett, and Klaproth have since examined the properties of the alloy of pure platinum and gold. To form the alloy it is necessary to fuse the metals with a strong heat, otherwise the platinum is only dispersed through the gold. When gold is alloyed with this metal, its colour is remarkably injured; the alloy having the appearance of bell-metal, or rather of tarnished silver. Dr. Lewis found that when the platinum amounted only to a sixth, the alloy had nothing of the colour of gold; even one forty-second part of platinum greatly injured the colour of the gold. The alloy formed by Mr. Hatchett of nearly eleven parts of gold to one of platinum had the colour of tarnished silver. It was very ductile and elastic. The colour of gold does not become predominant till it constitutes eight-ninths of the alloy.

From these facts it follows that gold cannot be alloyed with $\frac{1}{10}$ of its weight of platinum without easily detecting the fraud by the debasement of the colour; and Vauquelin has shown that when the platinum does not exceed $\frac{1}{10}$ it may be completely separated from gold by rolling out the alloy into thin plates, and digesting it in nitric acid, the platinum is taken up by the acid while the gold remains. But if the quantity of platinum exceed $\frac{1}{10}$ it cannot be separated completely by that method.

Osmium. Iridium. Rhodium. Palladium.—We have already observed that crude platinum is exceedingly impure, containing, as imported from America, not less than nine other metals. Of these nine, the four we have now enumerated constitute so many distinct parts, and have hitherto never been found in any other state or situation than as constituents of crude platinum: on which account it appears most congruous with a scientific work to treat of them under the present article.

It has been already observed, that in dissolving crude platinum in nitro-muriatic acid, a black powder is separated, the nature of which has been disputed. Some have regarded it as oxyd of iron, and others as plumbago; while, to settle the dispute, Mr. Tennant has lately ascertained it to contain two new metals. If in treating the crude platinum a large proportion of strong acid at a boiling temperature is made use of, nearly the whole of the black powder is dissolved, and the platinum, thrown down from the solution, by muriated ammonia, instead of being yellow is of a brick red. But if a weaker acid at a much lower temperature be employed, the solution is much less coloured, and nearly three per cent of this black powder remains, which may be readily separated by filtration and washing.

This black powder is partly in scales, and partly pulverulent. It leaves black traces on paper as plumbago does, but differs remarkably from this latter in its specific gravity, which is = 10.7. It unites readily with lead, but the compound, even if containing no more than $\frac{1}{11}$ of this black matter, possesses very little fluidity when melted. Nitrous acid dissolves all the lead, leaving the other

PLATINUM.

ingredient nearly in the same state as at first. With bismuth, zinc, and tin, the effects are nearly similar; but with copper at a very high heat it contracts a more intimate union, for by digesting the compound in nitro-muriatic acid, some of the powder was taken up together with the copper, forming a very dark-coloured solution.

With silver and gold it unites easily and intimately; and is incapable of being separated from either by cupellation, or from gold even by quartation: the alloys contain considerable ductility, and the colour of that with gold is not materially different from pure gold.

If this black powder be mixed with a large proportion of caustic soda, and kept for some time at a red heat, in a silver crucible, the mass acquires a brownish-yellow colour. On the addition of water, a peculiarly pungent odour is extricated, and the alkali with part of the yellow powder is dissolved.

This alkaline solution contains the oxyds of *osmium* and *iridium*: the former of which may be obtained pure by slightly supersaturating the solution with sulphuric acid, and proceeding to distillation; the metallic oxyd being very volatile, rising with the water, and remaining in solution with this fluid in the receiver: as, however, a little sulphuric acid is liable to come over, a second very gentle distillation is required to obtain the oxyd quite pure.

In this manner we obtain the oxyd of *osmium*. But if the black powder containing the oxyds of both the metals we have thus glanced at be fused with four times its weight of caustic potash, it will give a green saline mass; from which by digestion with water a green solution will be obtained, while some green powder will remain undissolved. The alkaline solution is to be saturated with muriatic acid, by which a green precipitate will be obtained, and this, together with the green powder, is to be digested in strong muriatic acid. The deep green muriatic solution thus prepared contains the oxyds of *iridium*, iron, and *osmium*, and when heated to ebullition its colour changes to a bright red. It is now to be gently evaporated to dryness, and the residue being treated with alcohol, the muriat of iron will be dissolved, leaving behind a red powder entirely free from this metal. This red powder being calcined at a red heat in an open crucible, then first arises muriatic acid, and then a vapour which tinges the flame of the coals of a fine blue, and which doubtless is the oxyd of *osmium*: a black powder remains behind, which when mixed with borax, and exposed to a very high heat, is reduced into a half-fused granular metal of a white colour, and very brittle, which is pure *iridium*.

All that is known of the newly discovered metal called *rhodium* has been communicated to the public by Dr. Wollaston. It is thus procured. Some crude platina being digested in moderately dilute nitro-muriatic acid, a brownish-red solution is obtained; from this the platina is to be separated for the most part by muriat of ammonia, and the residual liquor is to be heated with zinc: by this treatment a black powder will be obtained, and the supernatant fluid will consist of the muriats of zinc and iron. The black powder by digestion in very dilute nitric acid will be freed from the copper and lead which it usually contains, and the residue is to be digested in dilute nitro-muriatic acid till every thing soluble is taken up. To this solution a little common salt is to be added, and the whole evaporated to dryness; after

which, by repeatedly washing with warm alcohol the soda muriats of platina and palladium will be dissolved, leaving behind a pure soda muriat of rhodium.

If the alcoholic solution be mixed with a solution of muriated ammonia, by which the greater part of the platinum contained in it will be precipitated, the supernatant liquor being then poured off and diluted, there is to be added prussiat of potash, as long as any precipitate is produced. By this means is obtained a deep orange-coloured sediment, which changes by degrees to a dirty bottle-green. This, when dried, is to be heated with a little sulphur, and fused into a button; after which it is to be strongly heated with glass of borax, till in cooling it acquires a bright metallic surface. Being now separated from the borax, and exposed to the flame of the blow-pipe, the sulphur is volatilized, and there remains behind a spongy, malleable, metallic mass, which is pure *palladium*.

Osmium differs from all other metallic bodies in the facility with which it is oxydized when heated in the open air, or when fused with potash, while at the same time it resists the action of acids. It is equally distinguished by the great volatility of its oxyd, its peculiar smell, its solubility in water, its sweet taste, and the yellow colour which it assumes with potash. The action of the simple combustibles upon *osmium* have not been tried; nor do we know much of its combination with other metals.

Iridium has the appearance of platinum, and seems to resist the action of heat at least as strongly as that metal. It resists the action of all acids, even the nitro-muriatic almost completely: much more than three hundred parts of that acid being necessary to dissolve one of *iridium*. Its affinity with oxygen is very weak, but like all the other metals it unites with that principle. The simple combustibles have little action on it. Lead easily unites with it; and gold and silver in some degree; the colour of the gold not being essentially changed by the alloy.

Rhodium does not seem to be oxydized by exposure to air, even though assisted by heat: neither is it much acted upon by acids. It unites with sulphur readily, and, like *palladium*, is rendered fusible by it; as it is also by an union with arsenic.

Palladium obtained in a metallic state is white, and when polished bears a very close resemblance to platinum. It is rather harder than wrought iron; its specific gravity varies from 11.871 to 10.972. It is nearly as malleable as platinum, and is not altered by exposure to air; requires a violent heat to fuse it, and when strongly heated assumes a blue colour. It readily unites with sulphur; but is not altered with melted charcoal: the effects of hydrogen upon it are not known. Azot does not appear to influence it: muriatic acid oxydizes it. It forms an alloy with most metals.

PLATING, is the art of covering baser metals with a thin plate of silver either for use or for ornament. It is said to have been invented by a spur-maker, not for show but for real utility. Till then the more elegant spurs in common use were made of solid silver; and from the flexibility of that metal, they were liable to be bent into inconvenient forms by the slightest accident. To remedy this defect, a workman at Birmingham contrived to make

the branches of a pair of spurs hollow, and to fill that hollow with a slender rod of steel or iron. Finding this a great improvement, and being desirous of adding cheapness to utility, he continued to make the hollow larger, and of course the iron thicker and thicker, till at last he discovered the means of coating an iron spur with silver in such a manner as to make it equally elegant with those which were made wholly of that metal. The invention was quickly applied to other purposes: and to numberless utensils which were formerly made of brass or iron are now given the strength of these metals, and the elegance of silver, for a small additional expense. The silver plate was formerly made to adhere to the baser metal by means of solder; which is of two kinds, the soft and the hard, or the tin and silver solders. The former of these consists of tin alone, the latter generally of three parts of silver and one of brass. When a buckle, for instance, is to be plated by means of the soft solder, the ring, before it is bent, is first tinned, and then the silver plate is gently hammered upon it, the hammer employed being always covered with a piece of cloth. The silver now forms, as it were, a mould to the ring, and whatever of it is not intended to be used is cut off. This mould is fastened to the ring of the buckle by two or three cramps of iron-wire; after which the buckle, with the plated side undermost, is laid upon a plate of iron sufficiently hot to melt the tin, but not the silver. The buckle is then covered with powdered resin, or anointed with turpentine; and lest there should be a deficiency of tin, a small portion of rolled tin is likewise melted on it. The buckle is now taken off with tongs, and commonly laid on a bed of sand; where the plate and the ring, while the solder is yet in a state of fusion, are more closely compressed by a smart stroke with a block of wood. The buckle is afterwards bent and finished.

The mode of plating at present is, to fasten plates of silver upon thicker plates of copper, and then rolling them together into thin plates. The copper is twelve times thicker than the silver, and one ounce of silver is rolled to a surface of three feet or more. The plates being thus made, they are then stamped by a single stroke into the size and form of buckles, buttons, spoons, &c.

PLATO, an illustrious philosopher of antiquity, was born at Athens about 129 years B. C. His father was Aristo, the son of Aristocles, from whom he refers his origin to Solon the legislator; but his mother was Perictione, who descended from Neleus, the son of Codrus. While he was an infant, his parents are said to have placed him in Hymettus, being desirous on his account to sacrifice to the gods of that mountain, viz. Pan, and the nymphs, and the pastoral Apollo. In the mean time the bees approaching as he lay, filled his mouth with honey-combs, as an omen that in future it might be truly said of him,

Words from his tongue than honey sweeter
flow'd.

When he was a young man, he first betook himself to Dionysius the grammarian, for the purpose of acquiring common literature. After him, he employed the Argive Aristo as his instructor in Gymnastic, from whom he is said to have derived the name of Plato; for prior to this he was called Aristocles, from his grandfather. But he was so called from having those two parts of the body, the breast and forehead, broad in the extreme.

For his preceptor in music, Plato had Draco, the son of Damon, and of this master he makes mention in his Republic. After this he was instructed by the tragedians, who at that time were celebrated as the preceptors of Greece. He was likewise conversant with dithyrambic writers, as is evident from his Phædrus, which plainly breathes the dithyrambic character, and is said to have been the first dialogue which Plato composed. He was much delighted too with the comic Aristophanes and Sophron, from whom he learned the imitation of persons in dialogues. Plato also composed the following epigram on Aristophanes:

The graces emulous a grove to find
Which time might ne'er impair,
Met with the soul of Aristophanes,
And found a temple there.

He is likewise said to have written tragic and dithyrambic poems, and some other poetical pieces, all which he burned as soon as he began to associate with Socrates; at the same time repeating this verse,

Vulcan draw near, 'tis Plato asks your aid.

After the death of Socrates, he had another preceptor, the Heraclitean Cratylus, upon whom he also composed a dialogue, which is inscribed Cratylus, or concerning the rectitude of names. After he had been sufficiently instructed by this master, he went into Italy, where finding Archytus restoring a Pythagoric school, he became his disciple.

When he was in Syracuse with Dionysius the tyrant, he endeavoured to change the tyranny into an aristocracy, and it was for this purpose that he visited the tyrant. His efforts, however, were unsuccessful; for Dionysius was so indignant at the freedom of his discourse, and the dignity of his manners, that he ordered him, soon after his arrival at court, to depart at sun-rise; and when he again sailed to Sicily, at the solicitations of Dion, the tyrant delivered him to a Sicilian merchant to be sold as a slave.

Plato likewise went into Egypt for the purpose of conversing with the priests of that country, and from them learned whatever pertains to sacred rites. As he also wished to converse with the magi, but was prevented by the war which at that time broke out in Persia, he went to Phœnicia, and meeting with the magi of that country, was instructed by them in magic.

On his return to Athens, he established a school in the academy, separating a part

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of this Gymnasium into a temple to the muses. Here Timon the misanthrope associated with Plato alone. Plato allured very many to philosophical discipline; for he avoided the Socratic irony, and did not adopt the venerable oath of the Pythagoreans, their custom of keeping their gates shut, and their *ipse dixit*, as he wished to conduct himself in a more politic manner towards all men. His fame drew disciples from all parts, when he would admit them, as well as invitations to come to reside in many of the other Grecian states; but the three that most distinguished themselves were Spusippus his nephew, who continued the academy after him, Xenocrates the Caledonian, and the celebrated Aristotle. It is said also that Theophrastus and Demosthenes were two of his disciples. He had, it seems, so great a respect for the science of geometry and the mathematics, that he had the following inscription painted in large letters over the door of his academy: LET NO ONE ENTER HERE, UNLESS HE HAS A TASTE FOR GEOMETRY AND THE MATHEMATICS!

Plato lived 81 years, and died on his birthday. He was sumptuously buried by the Athenians; and on his tomb they inscribed the following epitaph:

Pæon and Plato from Apollo sprung,
The body's saviour this, and that the soul's.

The character of this philosopher has always been high. Besides the advantages of a noble birth, he had a large and comprehensive understanding, a vast fund of wit and good taste, great evenness and sweetness of temper, all cultivated and refined by education and travel; so that it is no wonder if he was honoured by his countrymen, esteemed by strangers, and adored by his scholars. The ancients thought more highly of Plato than of all their philosophers; they always called him the divine Plato; and they seem resolved that his descent should be more than human. "There are (says Apuleius) who assert Plato to have sprung from a more sublime conception; and that his mother Perictione, who was a very beautiful woman, was impregnated by Apollo in the shape of a spectre." Plutarch, Suidas, and others, affirm this to have been the common report at Athens: and it affords some probability that his parents themselves had some faith in the story, that they took him while an infant, as we have already related, to Hymettus, to make a sacrifice to the muses. Apuleius relates, that Socrates, the night before Plato was recommended to him, dreamed that a young swan fled from Cupid's altar in the academy, and settled in his lap; thence soared to heaven, and delighted the gods with its music: and when Aristo the next day presented Plato to him, "Friend (says Socrates), this is the swan of Cupid's academy." The Greeks loved fables: they show, however, in the present case, what exceeding respect was paid to the memory of Plato. Tully perfectly adored him; tells us, that he was justly called by Panætius, the di-

vine, the most wise, the most sacred, the Homer of philosophers; entitled him to Atticus, *Deus ille noster*; thinks, that if Jupiter had spoken Greek, he would have spoken in Plato's language; and made him so implicitly his guide in wisdom and philosophy, as to declare, that he had rather err with Plato than be right with any one else. But, panegyric aside, Plato was certainly a very wonderful man, of a large and comprehensive mind, an imagination infinitely fertile, and of a most flowing and copious eloquence. Nevertheless, the strength and heat of fancy prevailing in his composition over judgment, he was too apt to soar beyond the limits of earthly things, to range in the imaginary regions of general and abstracted ideas; and on which account, though there is always a greatness and sublimity in his manner, he did not philosophize so much according to truth and nature as Aristotle, though Cicero did not scruple to give him the preference.

The writings of Plato are all in the way of dialogue, where he seems to deliver nothing from himself, but every thing as the sentiments and opinions of others, of Socrates chiefly, of Timæus, &c. He does not mention himself anywhere, except once in his *Phædo*; and another time in his *Apology* for Socrates. His style, as Aristotle observed, is betwixt prose and verse: on which account, some have not scrupled to rank him with the poets. There is a better reason for so doing than the elevation and grandeur of his style: his matter is oftentimes the offspring of imagination, instead of doctrines or truths deduced from nature. The first edition of Plato's works in Greek was put out by Aldus at Venice, in 1513; but a Latin version of him by Marsilius Ficinus had been printed there in 1491. They were reprinted together at Lyons in 1588, and at Francfort in 1602. The famous printer, Henry Stephens, in 1578, gave a most beautiful and correct edition of Plato's works at Paris, with a new Latin version by Serranus, in three volumes folio. The latest edition with which we are acquainted is the Bipont edition of 1781, in 12 vols. octavo: it is the only edition of the entire works of Plato that has been published in an octavo form: the Greek text is taken from Serranus, and the Latin version is Ficinus's.

Of the Dialogues of Plato an edition was published by Foster, Oxon, 8vo, 1745-52-65: the first of these is the most valuable and rare. Beister published the *Meno*, *Crito*, and both the *Alcibiades* of Plato, with some notes of Gedike, Gottleber, and Scheneider, Berol. 8vo. 1780, and again more completely in 1790.

PLATONIC, something that relates to Plato, his school, philosophy, opinions, or the like.

PLATONIC BODIES are the same with what we otherwise call regular bodies.

PLATONIC LOVE denotes a pure spiritual affection, subsisting between the different sexes, abstracted from all carnal appetites, and regarding no other object but the mind, and its

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beauties: or it is even a sincere disinterested friendship, subsisting between persons of the same sex, abstracted from any selfish views, and regarding no other object but the person.

The term took its rise from the philosopher Plato, a strenuous advocate for each kind.

The world has a long time laughed at Plato's notions of love and friendship.

PLATONIC YEAR, or the **GREAT YEAR**, is a period of time determined by the revolution of the equinoxes, or the space wherein the stars and constellations return to their former places in respect of the equinoxes. The Platonic year, according to Tycho Brahe, is 25816, according to Ricciolus 25920, and according to Cassini 24800 years.

PLATONISM, the philosophy of Plato, which was divided into three branches, theology, physics, and mathematics. Under theology were comprehended metaphysics and ethics, or that which in modern language is called moral philosophy. Plato wrote likewise on dialectics, but with such inferiority to his pupil Aristotle, that his works in that department of science are seldom mentioned.

The ancient philosophers always began their theological systems with some disquisition on the nature of the gods, and the formation of the world; and it was a fundamental doctrine with them, that "from nothing nothing can proceed." We are not to suppose that this general axiom implied nothing more than that for every effect there must be a cause; for this is a proposition which no man will controvert who understands the terms in which it is expressed; but the ancients believed that a proper creation is impossible even to Omnipotence, and that to the production of any thing a material is not less necessary than an efficient cause. That with respect to this important question Plato agreed with his predecessors and contemporaries appears evident to us from the whole tenor of his *Timæus*. We agree with Dr. Enfield in thinking, that in this dialogue, which comprehends his whole doctrine on the subject of the formation of the universe, matter is so manifestly spoken of as eternally co-existing with God, that this part of his doctrine could not have been mistaken by so many able and learned writers, had they not been seduced by the desire of establishing a coincidence of doctrine between the writings of Plato and Moses. It is certain that neither Cicero, nor Apuleius, nor Alcinoüs, nor even the later commentator Chalcidius, understood their master in any other sense than as admitting two primary and incorruptible principles, God, and matter; to which we shall afterwards see reason to add a third, namely ideas. The passages quoted by those who maintain the contrary opinion are by no means sufficient for their purpose. Plato, it is true, in his *Timæus*, calls God the parent of the universe, and in his *Sophista* speaks of him as "forming animate and inanimate beings, which did not before exist;" but these expressions do not necessarily imply that this offspring of Deity was produced from nothing, or that no prior matter existed from which these new beings were formed. Through the whole dialogue of the *Timæus*, Plato supposes two eternal and independent causes of all things; one that by which all things are made, which is God; the other, that from which all things are made, which is matter. He

distinguishes between God, matter, and the universe, and supposes the Architect of the world to have formed it out of a mass of pre-existent matter. Matter, according to Plato, is an eternal and infinite principle. His doctrine on this head is thus explained by Cicero: "Matter, from which all things are produced and formed, is a substance without form or quality, but capable of receiving all forms, and undergoing every kind of change; in which, however, it never suffers annihilation, but merely a solution of its parts, which are in their nature infinitely divisible, and move in portions of space which are also infinitely divisible. When that principle which we call quality is moved, and acts upon matter, it undergoes an entire change, and those forms are produced, from which arises the diversified and coherent system of the universe." This doctrine Plato unfolds at large in his *Timæus*, and particularly insists upon the notion, that matter has originally no form, but is capable of receiving any. He calls it the mother and receptacle of forms, by the union of which with matter the universe becomes perceptible to the senses; and maintains, that the visible world owes its forms to the energy of the divine intellectual nature.

Our author is supported in drawing this inference by the testimony of Diogenes Laertius, who surely understood the language and dogmas of Plato better than the most accomplished modern scholar can pretend to do; yet Dr. Ogilvie has lately expressed great surprise that any one should consider matter as having been, in Plato's opinion, uncreated; and he boldly affirms, that Laertius, instead of asserting that spirit and matter were the principles of all things, ought to have said that God alone, in Plato's estimation, was their original. To prove this, he gives from the *Timæus* a quotation, in which the founder of the Academy declares that God framed heaven and earth, and the inferior deities; and that as he fashioned, so he pervades all nature. He observes, that Cicero denominates the god of Plato the maker, and the god of Aristotle only the governor, of the world. And to satisfy those who may demand a particular proof of Plato's having taught a real creation, he affirms that his writings abound with declarations on the subject, of which the meaning cannot be misapprehended. "With this purpose (says he) Plato denominates at one time the principles or substance of all things, *τὸν κατὰ θεὸν ἀμείωτον*, the productions of the efficient Deity, and at others enters more particularly into the question. Thus, he observes, that many persons are ignorant of the nature or power of mind or intellect, 'as having existed at the beginning, antecedent to all bodies.' Of this mind, he observes, that it is without exception, *πάντων ἀπορροιατός*, of all things the most ancient; and he subjoins, in order to remove all doubt of his purpose, that it is also *ἀρχὴ κινήσεως*, the cause or principle of motion."

With all possible respect for Dr. Ogilvie, of whose piety and erudition we are thoroughly convinced, we must take the liberty to say, that to us the declarations of Plato on this subject appear much less precise and explicit than they appear to him; and that the inference which he would draw from the words of Cicero seems not to flow necessarily from the sense of those words. That Plato believed God to have framed the heaven and the earth, and to have fashioned all nature, is a position which, as far as we know, has never been controverted; but between framing and fashion-

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ing the chaos or *ὡς πρῶτη*, and calling the universe into existence from non-entity, there is an infinite and an obvious difference. The distinction made by Cicero between the God of Plato and the God of Aristotle is a just distinction, but it will not bear the superstructure which the learned doctor builds upon it. Aristotle maintained the eternity of the world in its present form. Plato certainly taught that the first matter was in time reduced from a chaotic state into form by the power of the Demiurgus; but we have seen nothing in his writings which explicitly declares his belief that the first matter was itself created.

The learned Cudworth, who wished, like Dr. Ogilvie, to find a coincidence of doctrine between the theology of Plato and that of the gospel, strained all his faculties to prove that his favourite philosopher taught a proper creation; but he laboured in vain. He gives a number of quotations in support of his position; of which we shall here insert only those two upon which Dr. Ogilvie seems to lay the greatest stress. Plato, says the author of the Intellectual System, calls the one God *ὁς γῆν, οὐρανόν, καὶ θεοὺς, καὶ πάντα τὰ ἐν οὐρανῷ καὶ τὰ ἐν ᾗ, καὶ ὑπο γῆς ἀπὸ αὐτοῦ ἐργασίας*—"He that makes earth, and heaven, and the gods, and doth all things both in heaven, and hell, and under the earth." And again, "he by whose efficiency the things of the world (*ὅσπερ ἐν κόσμῳ, πρότερον οὐκ ὄντα*) were afterwards made when they were not before." Both Cudworth and Ogilvie think this last sentence an explicit declaration of Plato's belief in the creative power of God; but that they are mistaken has been evinced by Mosheim with a force of argument which will admit of no reply. In that part of the Sophist from which the quotation is taken, Plato considers the *δυναμὴν ποιητικὴν*, of which he is treating, as belonging both to God and to man; and he defines it in general to be "a certain power which is the cause that things may afterwards be which were not before." Cudworth wishes to confine this definition to the divine power; and adds from himself to the text which he quotes the following words, which are not in Plato, "or from an antecedent non-existence brought forth into being! That the incomparable author intended to deceive his reader we are far from imagining: his zeal for Platonism had deceived himself. Plato's definition comprehends the *δυναμὴν ποιητικὴν*, as well of man as of God; and therefore cannot infer a creative power any where, unless the father of the academy was so very absurd as to suppose human artists the creators of those machines which they have invented and made! Mosheim thinks that Cudworth was misled by too implicit a confidence in Ficinus; and it is not impossible that Dr. Ogilvie may have been swayed by the authority, great indeed, of the author of the Intellectual System.

That intellect existed antecedent to all bodies is indeed a Platonic dogma, from which Dr. Ogilvie, after Cudworth, wishes to infer that the doctrine of the creation was taught in the academy; but Dr. Ogilvie knows, that no man knew better than Cudworth, that Plato, with every other Greek philosopher, distinguished between body and matter; and that though he held the priority of intellect to the former, it by no means follows that he believed it to have existed antecedent to the latter. That he believed mind, or rather soul (for he distinguishes between the two), to be the cause or principle of motion, cannot be denied; but we are not therefore authorised to conclude that he likewise believed it to be the cause of the existence

of matter. That he believed mind to be the most ancient of all things, taking the word *things* in the most absolute sense, cannot be true, since by Dr. Ogilvie's own acknowledgment he held the existence and eternity of ideas, not to add that he believed *το εἶ* or *ταυταῖον*—the first hypostasis in his trinity, to be superior to mind and prior to it, though not in time, yet in the order of nature. When, therefore, he calls mind the most ancient of all things, he must be supposed to mean only that it is more ancient than all bodies and inferior souls. It is no reflection on the character of Plato that he could not, by the efforts of his own reason, acquire any notion of a proper creation; since we who have the advantage of his writings, and of writings infinitely more valuable, to instruct us, find it extremely difficult, if not impossible, to conceive how any thing can begin to be. We believe the fact on the authority of revelation; but should certainly never have agitated such a question, had it not been stated to us by writers inspired with celestial wisdom.

In the Platonic cosmogony we cannot therefore doubt but that the eternity of the *ὡς πρῶτη* was taken for granted. Whether it was an eternal and necessary emanation from an eternal mind, is not perhaps quite so evident, though our own opinion is, that it was believed to be self-existent. But be this as it may, which is not worth disputing, one thing is certain, that Plato did not believe it to have a single form or quality which it did not receive either from the Demiurgus or the Psyche—the second or third person of his trinity. Except Aristotle, all the Greek philosophers, who were not materialists, held nearly the same opinions respecting the origin of the world; so that in examining their systems we shall be greatly misled if we understand the terms *incorporeal* and *immaterial* as at all synonymous. It was also a doctrine of Plato, that there is in matter a necessary but blind and refractory force; and that hence arises a propensity in matter to disorder and deformity, which is the cause of all the imperfection which appears in the works of God, and the origin of evil. On this subject Plato writes with wonderful obscurity: but, as far as we are able to trace his conceptions, he appears to have thought, that matter, from its nature, resists the will of the Supreme Artificer, so that he cannot perfectly execute his designs; and that this is the cause of the mixture of good and evil which is found in the material world.

Plato, however, was no materialist. He taught, that there is an intelligent cause, which is the origin of all spiritual being, and the former of the material world. The nature of this great being he pronounced it difficult to discover, and when discovered impossible to divulge. The existence of God he inferred from the marks of intelligence, which appear in the form and arrangement of bodies in the visible world: and from the unity of the material system he concluded, that the mind by which it was formed must be one. God, according to Plato, is the supreme intelligence, incorporeal, without beginning, end, or change, and capable of being perceived only by the mind. He certainly distinguished the Deity not only from body, and whatever has corporeal qualities, but from matter itself, from which all things are made. He also ascribed to him all those qualities which modern philosophers ascribe to immaterial substance; and conceived him to be in his nature simple, unincircumscribed in space, the author of all regulated motion, and, in fine,

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possessed of intelligence in the highest perfection.

His notions of God are indeed exceedingly refined, and such as it is difficult to suppose that he could ever have acquired but from some obscure remains of primeval tradition, gleaned perhaps from the priests of Egypt, or from the philosophers of the East. In the Divine Nature he certainly believed that there are two, and probably that there are three, hypostases, whom he called *το εν* and *το εν, vous* and *ψυχη*. The first he considered as self-existent, and elevated far above all mind, and all knowledge; calling him, by way of eminence, the being or the one. The only attribute which he acknowledged in this person was goodness; and therefore he frequently styles him *το αγαθον*—“the good, or essential goodness.” The second he considered as mind, the wisdom or reason of the first, and the maker of the world; and therefore he styles him *vous*, *λογος*, and *δημιουργος*. The third he always speaks of as the soul of the world; and hence calls him *ψυχη*, or *ψυχη του κοσμου*. He taught that the second is a necessary emanation from the first, and the third from the second, or perhaps from the first and second.

Some have indeed pretended, that the Trinity, which is commonly called Platonic, was a fiction of the later Platonists, unknown to the founder of the school: but any person who shall take the trouble to study the writings of Plato will find abundant evidence that he really asserted a triad of divine hypostases, all concerned in the formation and government of the world. Thus, in his 10th book of Laws, where he undertakes to prove the existence of a Deity in opposition to atheists, he ascends no higher in the demonstration than to the *ψυχη* or mundane soul, which he held to be the immediate and proper cause of all the motion that is in the world. But in other parts of his writings he frequently asserts, as superior to the self-moving principle, an immovable *vous* or intellect, which was properly the demiurgus or framer of the world; and above this hypostasis one most simple and absolutely perfect being, who is considered in his Theology as *αυτοθεος*, the original deity, in contradiction from the others, who are only *θεοι εκ στοι*. These doctrines are to be gathered from his works at large, particularly from the *Timæus*, *Philebus*, *Sophista*, and *Epinomis*: but there is a passage in his second epistle to Dionysius, apparently written in answer to a letter which that monarch had required him to give a more explicit account than he had formerly done of the nature of God, in which the doctrine of a Trinity seems to be directly asserted. “After having said that he meant to wrap up his meaning in such obscurity, as that an adept only should fully comprehend it, he adds expressions to the following import: “The Lord of Nature is surrounded on all sides by his works: whatever is, exists by his permission: he is the fountain and source of excellence: around the second person are placed things of the second order; and around the third those of the third degree.” Of this obscure passage a very satisfactory explanation is given in Dr. Ogilvie's Theology of Plato, to which the narrow limits prescribed to such articles as this compel us to refer the reader. We shall only say, that the account which we have given of the Platonic Trinity is ably supported by the doctor.

In treating of the eternal emanation of the second and third hypostases from the first, the philosophers of the academy compare them to light and heat proceeding from the sun. Plato himself,

as quoted from Dr. Cudworth, illustrates his doctrine by the same comparison. For “*το αγαθον*, or the first hypostasis, is in the intellectual world the same (he says) to intellect and intelligibles that the sun is in the corporeal world to vision and visibles; for, as the sun is not vision itself, but the cause of vision, and as that light by which we see is not the sun, but only a thing like the sun; so neither is the Supreme or Highest Good properly knowledge, but the cause of knowledge; nor is intellect, considered as such, the best and most perfect being, but only a being having the form of perfection.” Again, “as the sun causes other things not only to become visible, but also to be generated; so the Supreme Good gives to things not only their capability of being known, but also their very essences by which they subsist; for this fountain of the Deity, this highest good, is not itself properly essence, but above essence, transcending it in respect both of dignity and of power.”

The resemblance which this trinity of Plato bears to that revealed in the gospel must be observed by every attentive reader; but the two doctrines are likewise in some respects exceedingly dissimilar. The third hypostases in the Platonic system appears in no point of view co-ordinate with the first or second. Indeed, the first is elevated far above the second, and the third sunk still further beneath it, being considered as a mere soul immersed in matter, and forming with the corporeal world, to which it is united, one compound animal. Nay, it does not appear perfectly clear, that Plato considered his *ψυχη του κοσμου* as a pure spirit, or as having subsisted from eternity as a distinct hypostasis. “This governing spirit, of whom the earth, properly so called, is the body, consisted, according to our author's philosophy, of the same and the other; that is, of the first matter, and of pure intelligence, framed to actuate the machinery of nature. The Supreme Being placed him in the middle of the earth; which, in the vivid idea of Plato, seemed itself to live, in consequence of an influence that was felt in every part of it. From this seat his power is represented as being extended on all sides to the utmost limit of the heavens; conferring life, and preserving harmony in the various and complicated parts of the universe. Upon this being God is said to have looked with peculiar complacency after having formed him as an image of himself, and to have given beauty and perfect proportion to the mansion which he was destined to occupy. According to the doctrine of *Timæus*, the Supreme Being struck out from this original mind innumerable spirits of inferior order, endowed with principles of reason; and he committed to divinities of secondary rank the task of investing these in material forms, and of dispersing them as inhabitants of the sun, moon, and other celestial bodies. He taught also, that at death the human soul is reunited to the *ψυχη του κοσμου*, as to the source from which it originally came.”

Such is the third person of the Platonic triad, as we find his nature and attributes very accurately stated by Dr. Ogilvie; and the Christian philosopher, who has no particular system to support, will not require another proof that the triad of Plato differs exceedingly from the Trinity of the Scriptures. Indeed the third hypostasis in this triad has so much the appearance of all that the ancients could mean by that which we call a creature, that the learned Cudworth, who wished, it is difficult to conceive for what reason, to find the sublim-

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est mystery of the Christian faith explicitly taught in the writings of a pagan philosopher, was forced to suppose, that Plato held a double $\psi\upsilon\chi\eta$, or soul, one $\epsilon\chi\kappa\omicron\sigma\mu\omicron\upsilon\sigma\iota\varsigma$ incorporated with the material world, and the other $\sigma\upsilon\pi\epsilon\tau\epsilon\tau\omicron\sigma\mu\omicron\upsilon\sigma\iota\varsigma$ or supramundane, which is not the soul but the governor of the universe. We call this a mere hypothesis; for, though the author displays vast erudition, and adduces many quotations in which this double psyche is plainly mentioned, yet all those quotations are taken from Platonists who lived after the propagation of the gospel, and who, calling themselves eclectics, freely stole from every sect such dogmas as they could incorporate with their own system, and then attributed those dogmas to their master. In the writings of Plato himself, there is not so much as an allusion to this supramundane psyche; and it is for this reason (the $\psi\upsilon\chi\eta$ of which he treats being so very inferior to the $\delta\eta\mu\iota\omicron\upsilon\gamma\omicron\upsilon\gamma\omicron\varsigma$ and $\alpha\gamma\alpha\theta\omicron\varsigma$) that we have expressed with hesitation his belief of three hypostases of the divine nature. Yet that he did admit so many seems more than probable both from the passage illustrated by Dr. Ogilvie, and from the attempt of Plotinus, one of his followers, to demonstrate that the number can be neither greater nor less. That his doctrine on this subject should be inaccurate and erroneous can excite no wonder; whilst it must be confessed to have such a resemblance to the truth, and to be so incapable of being proved by reasoning from effects to causes, that we could not doubt of his having inherited it by tradition, even though we had not complete evidence that something very similar to it was taught long before him, not only by Pythagoras and Parmenides, but by the philosophers of the East.

We have said that the Demiurgus was the maker of the world from the first matter which had existed from eternity; but in Plato's cosmogony there is another principle, more mysterious, if possible, than any thing which we have yet mentioned. This is his intellectual system of ideas, which it is not easy to collect from his writings, whether he considered as independent existences, or only as archetypal forms, which had subsisted from eternity in the $\lambda\omicron\gamma\omicron\varsigma$ or divine intellect. On this subject he writes with such exceeding obscurity, that men of the first eminence both among the ancients and the moderns have differed about his real meaning. Some have supposed, that by ideas he meant real beings subsisting from eternity, independent of all minds, and separate from all matter; and that of these ideas he conceived some to be living and others to be without life. In this manner his doctrine is interpreted by Tertullian among the ancients, and by the celebrated Brucker among the moderns; and not by them only, but by many others equally learned, candid, and acute. Cudworth, on the other hand, with his annotator Mosheim, contends, that by his ideal world, Plato meant nothing more than that there existed from eternity in the $\lambda\omicron\gamma\omicron\varsigma$ or mind of God a notion or conception of every thing which was in time to be made. This is certainly much more probable in itself, than that a man of enlarged understanding should have supposed, that there are somewhere in extramundane space real living incorporeal beings eating and drinking, which are the ideas of all the animals which ever have been or ever will be eating and drinking in this world. Yet Mosheim candidly acknowledges, that if the controversy were to be decided by the votes of the learned, he is doubtful whether it would be given for or against him; and Cudworth, though he

pleads the cause of his master with much ingenuity, owns, that on this subject his language cannot be vindicated. This indeed is most true; for Plato contends, that his ideas are not only the objects of science, but also the proper or physical causes of all things here below; that the idea of similitude is the cause of the resemblance between two globes; and the idea of dissimilitude the cause that a globe does not resemble a pyramid: he likewise calls them *οὐσιαι*, essences or substances, and many of his followers have pronounced them to be animals.

It was a fundamental doctrine in the system of Plato, that the Deity formed the material world after a perfect model, consisting of those ideas which had eternally subsisted in his own reason: and yet, with some appearance of contradiction, he calls this model "self-existent, indivisible, and eternally generated." Nay, he talks of it as being intelligent as well as eternal, and wholly different from the transcripts, which are subjected to our inspection. There is so much mystery, confusion, and apparent absurdity, in the whole of this system, as it has come down to us, that we must suppose the friends of Plato to have been intrusted with a key to his esoteric doctrines, which has long been lost; otherwise it would be difficult to conceive how that philosopher could have had so many admirers.

With almost every ancient theist of Greece, the founder of the academy believed in an order of beings called *δαίμονες*, which were superior to the souls of men, and struck off by the Demiurgus from the soul of the world. Of these the reader will find some account elsewhere. (See *DÆMON* and *POLYTHEISM*.) We mention them at present because they make an important appearance in Plato's system of Physics, which was built upon them, and upon the doctrine which has been stated concerning God, matter, and ideas. He taught, that the visible world was formed by the Supreme Architect uniting eternal and immutable ideas to the first matter; that the universe is one animated being, including within its limits all animated natures; that, in the formation of the visible and tangible world, fire and earth were first formed, and were afterwards united by means of air and water; that from perfect parts one perfect whole was produced of a spherical figure, as most beautiful in itself, and best suited to contain all other figures; that the elementary parts of the world are of regular geometrical forms, the particles of earth being cubical, those of fire pyramidal, those of air in the form of an octahedron, and those of water in that of an icosahedron; that these are adjusted in number, measure, and power, in perfect conformity to the geometrical laws of proportion; that the soul which pervades this sphere is the cause of its revolution round its centre; and, lastly, that the world will remain for ever, but that by the action of its animating principle it accomplishes certain periods, within which every thing returns to its ancient place and state. This periodical revolution of nature is called the Platonic or great year.

The metaphysical doctrines of Plato which treat of the human soul, and the principles of his system of ethics, cannot here be detailed; but it is worthy of observation in this place, that, preparatory to the study of all philosophy, he required from his disciples a knowledge of the elements of mathematics. In his Republic, he makes Glaucous, one of the speakers, recommend them for their usefulness in human life. "Arithmetic for accounts

and distributions; geometry for incampments and mensurations; music for solemn festivals in honour of the gods; and astronomy for agriculture, for navigation, and the like. Socrates, on his part, denies not the truth of all this, but still insinuates that they were capable of answering an end more sublime. "You are pleasant (says he) in your seeming to fear the multitude, lest you should be thought to enjoin certain sciences that are useless." 'Tis indeed no contemptible matter, though a difficult one, to believe, that through these particular sciences the soul has an organ purified and enlightened, which is destroyed and blinded by studies of other kinds; an organ better worth saving than a thousand eyes, in as much as truth becomes visible through this alone.

"Concerning policy, Plato has written at large in his Republic and in his Dialogue on Laws. He was so much enamoured with his own conceptions on this subject, that it was chiefly the hope of having an opportunity to realise his plan of a republic which induced him to visit the court of Dionysius. But they who are conversant with mankind, and capable of calmly investigating the springs of human actions, will easily perceive that his projects were chimerical, and could only have originated in a mind replete with philosophical enthusiasm. Of this nothing can be a clearer proof than the design of admitting in his republic a community of women, in order to give reason an entire controul over desire. The main object of his political institutions appears to have been, the subjugation of the passions and appetites, by means of the abstract contemplation of ideas. A system of policy, raised upon such fanciful grounds, cannot merit a more distinct consideration."

PLATOON, in the military art, a small square body of forty or fifty men, drawn out of a battalion of foot, and placed between the squadrons of horse, to sustain them; or in ambuscades, straits, and defiles, where there is not room for whole battalions or regiments. Platoons are also used when they form the hollow square, to strengthen the angles. The grenadiers are generally posted in platoons.

PLATTER. *s.* (from *plate*.) A large dish, generally of earth (*Dryden*).

PLAT-VEIN, or **PLATE-VEIN**, in a horse, a vein running on the inside of each fore thigh, a little below the elbow, so called among common farriers. It is the basilic vein.

PLATYLOBIUM, in botany, a genus of the class diadelphia, order decandria. Calyx campanulate, five-cleft; the two upper segments very large and obtuse; legume pedicelled, compressed, winged along the back, many-seeded. All Australasian shrubs, with yellow flowers.

PLATYPUS, in zoology, a genus of the class mammalia, order bruta. Mouth shaped like the bill of a duck; feet palmate. One species only, *P. anatinus*, duck-billed platypus.—"Of all the mammalia," says Dr. Shaw, "yet known, it seems the most extraordinary in its conformation; exhibiting the perfect resemblance of the beak of a duck engrafted on the head of a quadruped. So accurate is the similitude, that at first view it naturally excites the idea of some deceptive preparation by artificial means: the very epidermis, propor-

tion, serratures, manner of opening, and other particulars of the beak of a shoveller, or other broad-billed species of duck, presenting themselves to the view: nor is it without the most minute and rigid examination that we can persuade ourselves of its being the real beak or snout of a quadruped.

"The body is depressed, and has some resemblance to that of an otter in miniature: it is covered with a very thick, soft, and beaver-like fur, and is of a moderately dark brown above, and of a subferruginous white beneath. The head is flattish, and rather small than large: the mouth or snout, as before observed, so exactly resembles that of some broad-billed species of duck that it might be mistaken for such: round the base is a flat circular membrane, somewhat deeper or wider below than above; viz. below near the fifth of an inch, and above about an eighth. The tail is flat, furry like the body, rather short, and obtuse, with an almost bifid termination: it is broader at the base, and gradually lessens to the tip, and is about three inches in length: its colour is similar to that of the body. The length of the whole animal from the tip of the beak to that of the tail is thirteen inches: of the beak an inch and half. The legs are very short, terminating in a broad web, which on the fore-feet extends to a considerable distance beyond the claws; but on the hind feet reaches no farther than the roots of the claws. On the fore-feet are five claws, strait, strong, and sharp-pointed: the two exterior ones somewhat shorter than the three middle ones. On the hind-feet are six claws, longer and more inclining to a curved form than those of the fore-feet: the exterior toe and claw are considerably shorter than the four middle ones: the interior or sixth is seated much higher up than the rest, and resembles a strong sharp spur. All the legs are hairy above: the fore-feet are naked both above and below; but the hind-feet are naked above and hairy below. The internal edges of the under mandible, (which is narrower than the upper) are serrated or channelled with numerous striæ, as in a duck's bill. The nostrils are small and round, and are situated about a quarter of an inch from the tip of the bill, and are about the eighth of an inch distant from each other. There is no appearance of teeth; the palate is removed, but seems to have resembled that of a duck; the tongue also is wanting in the specimen. The ears or auditory foramina are placed about half an inch beyond the eyes; they appear like a pair of oval holes of the eighth of an inch in diameter, there being no external ear. On the upper part of the head, on each side, a little beyond the beak, are situated two smallish oval white spots, in the lower part of each of which are imbedded the eyes, or at least the parts allotted to the animal for some kind of vision; for from the thickness of the fur and the smallness of the organs they seem to have been but obscurely calculated for distinct vision, and are probably like those of moles, and some other animals of that tribe; or perhaps even

Phoca.

Phoca, Ursine Seal.

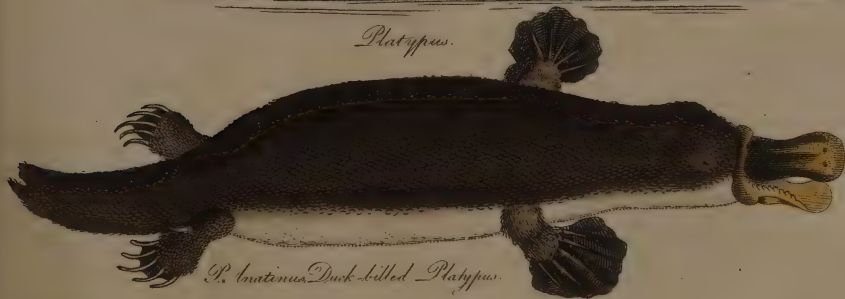


Trichechus.

T. Arcticus, Arctic Walrus.



Platypus.



P. lustratus Duck-billed Platypus.

subcutaneous; the whole apparent diameter of the cavity in which they were placed not exceeding the tenth of an inch.

"When we consider the general form of this animal, and particularly its bill and webbed feet, we shall readily perceive that it must be a resident in watery situations; that it has the habits of digging or burrowing in the banks of rivers, or under ground; and that its food consists of aquatic plants and animals. This is all that can at present be reasonably guessed at: future observations, made in its native regions, will, it is hoped, afford us more ample information, and will make us fully acquainted with the natural history of an animal which differs so widely from all other quadrupeds, and which verifies in a most striking manner the observation of Buffon; viz. that whatever was possible for nature to produce, has actually been produced.

"On a subject so extraordinary as the present, a degree of scepticism is not only pardonable, but laudable; and I ought, perhaps, to acknowledge that I almost doubt the testimony of my own eyes with respect to the structure of this animal's beak; yet must confess that I can perceive no appearance of any deceptive preparation; and the edges of the rictus, the insertion, &c. when tried by the test of maceration in water, so as to render every part completely moveable, seem perfectly natural; nor can the most accurate examination of expert anatomists discover any deception in this particular.

"The platypus is a native of Australasia or New Holland, and is at present in the possession of Mr. Dobson, so much distinguished by his exquisite manner of preparing specimens of vegetable anatomy." See Nat. Hist. Pl. CLXVIII.

PLATYSMA MYOIDES. (from *μας*, broad, *μυς*, a muscle, and *ειδος*, resemblance.) In myology, musculus cutaneus of Winslow. Quadratus genæ vel Latissimus colli of Douglas. Latissimus colli of Albinus. Detrahens quadratus. A thin muscle on the side of the neck, immediately under the skin, that assists in drawing the skin of the cheek downwards; and when the mouth is shut, it draws all that part of the skin to which it is connected below the lower jaw upwards.

PLATYSTACUS, in ichthyology. See **SILURUS ASPREDO**.

PLAUDIT. PLAU'DITE. *s.* Applause (*Denham*).

PLAUSIBILITY. *s.* (*plausibilité*, French.) Speciousness; superficial appearance of right (*Swift*).

PLAUSIBLE. *a.* (*plausible*, French.) Such as gains approbation; superficially pleasing or taking; specious; popular (*Clarendon*).

PLAUSIBLENESS. *s.* (from *plausible*.) Speciousness; show of right (*Sanderson*).

PLAUSIBLY. *ad.* (from *plausible*) 1. With fair show; speciously (*Collier*). 2. With applause: not in use (*Brown*).

PLAUSIVE. *a.* (from *plaudo*, Latin.) 1.

Applauding. 2. Plausible. A word not in use (*Shakspeare*).

PLAUTIANUS (Fulvius), an African of mean birth, who was banished for his seditious behaviour in the years of his obscurity. In his banishment Plautianus formed an acquaintance with the emperor Severus, who, some years after, ascended the imperial throne. This was the beginning of his prosperity; Severus invested him with power equal to his own at Rome and in the provinces, and he wanted but the name of emperor to be his equal. He was concerned in all the rapine and destruction which was committed through the empire, and he enriched himself with the possessions of those who had been sacrificed to the emperor's cruelty or avarice. He was put to death for conspiring against the emperor and his son Caracalla, who had some time before married his daughter Plautilla. Severus banished Plautilla to the island of Lipari, with her brother Plautius, where, seven years after, she was put to death by order of Caracalla, A.D. 211.

PLAUTUS (Marcus Accius), a comic writer of ancient Rome, born in Umbria, a province of Italy. His proper name was Marcus Accius, and he is supposed to have acquired the surname of Plautus from having splay feet. His parentage appears to have been mean; so that some have thought he was the son of a slave. Aulus Gellius says that Plautus was distinguished for his poetry on the theatre, and Cato for his eloquence in the forum, at the same time; and observes elsewhere from Varro, that he was so well paid for his plays as to double his stock in trading, in which he lost all he gained by the muses. He is said to have been reduced to work at a mill for his subsistence; but Varro adds, that his wit was his best support, as he composed three of his plays during this drudgery. He died the first year of the elder Cato's censorship, about the year of Rome 569, and 184 B. C. We have twenty of his plays extant, though not all of them entire. Five of them, comedies, have been elegantly translated into English by Mr. B. Thornton, and published in 2 vols. 8vo. 1767.

The editio princeps was published in 1472, in folio: it is a very beautiful work, and was edited by Georgius Merula. The folio edition of Lambinus in 1577 is very admirable; other valuable editions are those of Taubman in 1612—22, of Gronovius in 1684, of Ernesti in 1760, and the Bipont editions of 1779 and 1788.

TO PLAY. *v. n.* (*plegan*, Saxon.) 1. To sport; to frolic; to do something not as a task, but for pleasure (*Milton*). 2. To toy; to act with levity (*Milton*). 3. To be dismissed from work (*Shakspeare*). 4. To trifle; to act wantonly and thoughtlessly (*Temple*). 5. To do something fanciful (*Shakspeare*). 6. To practise sarcastic merriment (*Pope*). 7. To mock; to practise illusion (*Shakspeare*). 8. To game; to contend at some game (*Shakspeare*). 9. To do any thing trickish or deceitful (*Addison*).

16. To touch a musical instrument (*Gran.*). 11. To operate; to act. Used of any thing in motion: as, *the cannons play* (*Cheyne*). 12. To wanton; to move irregularly: *the leaves play with the wind* (*Dryden*). 13. To personate a drama (*Shakspeare*). 14. To represent a character (*Donne*). 15. To act in any certain character (*Collier*).

To PLAY. *v. a.* 1. To put in action or motion: as, *he played his cannon*. 2. To use an instrument of music (*Gay*). 3. To act a mirthful character (*Milton*). 4. To exhibit dramatically (*Shakspeare*). 5. To act; to perform (*Sidney*).

PLAY. *s.* 1. Action not imposed; not work. 2. Amusement; sport (*Milton*). 3. A drama; a comedy or tragedy, or any thing in which characters are represented by dialogue and action (*Dryden*). 4. Game; practice of gaming; contest at a game (*Shakspeare*). 5. Practice in any contest (*Tillotson*). 6. Action; employment; office (*Dryden*). 7. Practice; action; manner of acting (*Sidney*). 8. Act of touching an instrument. 9. Irregular and wanton motion. 10. A state of agitation or ventilation (*Dryden*). 11. Room for motion (*Moxon*). 12. Liberty of acting; swing (*Ad-dison*).

PLAYBOOK. *s.* (*play and book.*) Book of dramatic compositions (*Swift*).

PLAYDAY. *s.* (*play and day.*) Day exempt from tasks or work (*Swift*).

PLAYDEBT. *s.* (*play and debt.*) Debt contracted by gaming (*Arbuthnot*).

PLAYER. *s.* (*from play.*) 1. One who plays. 2. An idler; a lazy person (*Shaks.*). 3. Actor of dramatic scenes (*Sidney*). 4. A mimic (*Dryden*). 5. One who touches a musical instrument. 6. A gamester. 7. One who acts in play in any certain manner (*Carew*).

PLAYERS ON HIGH AND LOW INSTRUMENTS. A title assumed by the French minstrels of the fourteenth century, when the laws of counterpoint were forming, and began to give exercise to bass and treble instruments in concert. A denomination which was afterwards confirmed by a charta in the year 1401, granted them by Charles VI.

PLAYFELLOW. *s.* (*play and fellow.*) Companion in amusement (*Spenser*).

PLAYFUL. *a.* (*play and full.*) Sportive; full of levity (*Addison*).

PLAYGAME. *s.* (*play and game.*) Play of children (*Locke*).

PLAYHOUSE. *s.* (*play and house.*) House where dramatic performances are represented.

PLAYPLEASURE. *s.* (*play and pleasure.*) Idle amusement (*Bacon*).

PLAYSOME. *a.* (*play and some.*) Wanton; full of levity.

PLAYSOMENESS. *s.* Wantonness; levity.

PLAYTHING. *s.* (*play and thing.*) Toy; thing to play with (*Otway*).

PLAYWRIGHT. *s.* (*play and wright.*) A maker of plays (*Pope*).

PLEA. *s.* (*plaid, old French.*) 1. The act or

form of pleading. 2. Thing offered or demanded in pleading (*Shakspeare*). 3. Allegation (*Milton*). 4. An apology; an excuse (*Milton*).

PLEA, in law, is what either party alleges for himself in court, in a cause there depending; and in a more restrained sense, it is the defendant's answer to the plaintiff's declaration. Pleas are usually divided into those of the crown and common pleas. Pleas of the crown are all suits in the king's name, or in the name of the attorney-general in behalf of the king, for offences committed against his crown and dignity, and against his peace; as treason, murder, felony, &c. See ARRAIGNMENT. Common pleas are such suits as are carried on between common persons in civil cases. These pleas are of two sorts; dilatory pleas, and pleas to the action. Dilatory pleas are such as tend merely to delay or put off the suit, by questioning the propriety of the remedy, rather than by denying the injury: pleas to the action are such as dispute the very cause of suit.

(1.) Dilatory pleas are, 1. To the jurisdiction of the court; alleging, that it ought not to hold plea of this injury, it arising in Wales or beyond sea; or because the land in question is of ancient demesne, and ought only to be demanded in the lord's court, &c. 2. To the disability of the plaintiff, by reason whereof he is incapable to commence or continue the suit; as, that he is an alien enemy, outlawed, excommunicated, attainted of treason or felony, under a præmunire, not in *rerum natura* (being only a fictitious person), an infant, a feme-covert, or a monk professed. 3. In abatement: which abatement is either of the writ, or the count, for some defect in one of them; as by misnaming the defendant, which is called a misnomer; giving him a wrong addition, as esquire instead of knight; or other want of form in any material respect. Or, it may be that the plaintiff is dead; for the death of either party is at once an abatement of the suit.

These pleas to the jurisdiction, to the disability, or in abatement, were formerly very often used as mere dilatory pleas, without any foundation in truth, and calculated only for delay; but now by stat. 4 and 5 Ann. c. 16. no dilatory plea is to be admitted without affidavit made of the truth thereof, or some probable matter shown to the court to induce them to believe it true. And with respect to the pleas themselves, it is a rule, that no exception shall be admitted against a declaration or writ, unless the defendant will in the same plea give the plaintiff a better; that is, show him how it might be amended, that there may not be two objections upon the same account.

All pleas to the jurisdiction conclude to the cognizance of the court; praying "judgment, whether the court will have further cognizance of the suit." Pleas to the disability conclude to the person; by praying "judgment, if the said A. the plaintiff ought to be answered." And pleas in abatement (when the suit is by original) conclude to the writ or declaration

by praying "judgment of the writ or declaration, and that the same may be quashed," *casetur*, made void, or abated: but if the action be by bill, the plea must pray "judgment of the bill," and not of the declaration; the bill being here the original, and the declaration only a copy of the bill.

When these dilatory pleas are allowed, the cause is either dismissed from that jurisdiction, or the plaintiff is stayed till his disability be removed; or he is obliged to sue out a new writ, by leave obtained from the court, or to amend and new-frame his declaration. But when, on the other hand, they are over-ruled as frivolous, the defendant has judgment of *respondet ouster*, or to answer over in some better manner. It is then incumbent on him to plead.

(2.) A plea to the action; that is, to answer to the merits of the complaint. This is done by confessing or denying it.

A confession of the whole complaint is not very usual; for then the defendant would probably end the matter sooner, or not plead at all, but suffer judgment to go by default. Yet sometimes after tender and refusal of a debt, if the creditor harasses his debtor with an action, it then becomes necessary for the defendant to acknowledge the debt, and plead the tender; adding, that he has always been ready, *tout temps prêt*, and is still ready, *encore prêt*, to discharge it: for a tender by the debtor and refusal by the creditor will in all cases discharge the costs, but not the debt itself; though in some particular cases the creditor will totally lose his money. But frequently the defendant confesses one part of the complaint (by a *cognovit actionem* in respect thereof), and traverses or denies the rest; in order to avoid the expence of carrying that part to a formal trial, which he has no ground to litigate. A species of this sort of confession is the payment of money into court: which is for the most part necessary upon pleading a tender, and is itself a kind of tender to the plaintiff; by paying into the hands of the proper officer of the court as much as the defendant acknowledges to be due, together with the costs hitherto incurred, in order to prevent the expence of any further proceedings. This may be done upon what is called a motion; which is an occasional application to the court by the parties or their counsel, in order to obtain some rule or order of court, which becomes necessary in the progress of a cause; and it is usually grounded upon an affidavit (the perfect tense of the verb *affido*), being a voluntary oath before some judge or officer of the court, to evince the truth of certain facts upon which the motion is grounded: though no such affidavit is necessary for payment of money into court. If, after the money is paid in, the plaintiff proceeds in his suit, it is at his own peril: for, if he does not prove more due than is so paid into court, he shall be nonsuited and pay the defendant's costs; but he shall still have the money so paid in, for that the defendant has acknowledged to be his due. To this head may also be referred the practice

of what is called a set-off; whereby the defendant acknowledges the justice of the plaintiff's demand on the one hand; but, on the other, sets up a demand of his own, to counterbalance that of the plaintiff, either in the whole or in part; as, if the plaintiff sues for ten pounds due on a note of hand, the defendant may set off nine pounds due to himself for merchandize sold to the plaintiff; and, in case he pleads such set-off, must pay the remaining balance into court.

Pleas that totally deny the cause of complaint are either the general issue, or special plea in bar.

1. The general issue, or general plea, is what traverses, thwarts, and denies at once the whole declaration, without offering any special matter whereby to evade it. As in trespass either *vi et armis*, or on the case, "*non culpabilis*, not guilty;" in debt upon contracts, "*nihil dedet*, he owes nothing;" in debt on bond, "*non est factum*, it is not his deed;" "on an *assumpsit*," "*non assumpsit*, he made no such promise." Or in real actions, "*nul tort*, no wrong done; *nul disseisin*, no disseisin;" and in a writ of right, the misprision is, that "the tenant has more right to hold than the demandant has to demand." These pleas are called the general issue, because, by importing an absolute and general denial of what is alleged in the declaration, they amount at once to an issue; by which we mean a fact affirmed on one side and denied on the other.

2. Special pleas in bar of the plaintiff's demands are very various, according to the circumstances of the defendant's case. As, in real actions, a general release or a fine; both of which may destroy and bar the plaintiff's title. Or, in personal actions, an accord, arbitration, conditions performed, nonage of the defendant, or some other fact which precludes the plaintiff from his action. A justification is likewise a special plea in bar.

To PLEACH. *v. a.* (*plesser*, French.) To bend; to interweave: not in use (*Shakspeare*).

To PLEAD. *v. n.* (*plaider*, French.) 1. To argue before a court of justice (*Gran.*). 2. To speak in an argumentative or persuasive way for or against; to reason with another (*Shaks.*). 3. To be offered as a plea (*Dryden*).

To PLEAD. *v. a.* 1. To defend; to discuss (*Shakspeare*). 2. To allege in pleading or argument (*Spenser*). 3. To offer as an excuse (*Dryden*).

PLEADABLE. *a.* (from *plead*.) Capable of being alleged in plea (*Dryden*).

PLEADER. *s.* (*plaideur*, French.) 1. One who argues in a court of justice (*Swift*). 2. One who speaks for or against (*Shakspeare*).

PLEADING. *s.* (from *plead*.) Act or form of pleading (*Swift*).

PLEADINGS. Pleadings, in general, signify the allegations of parties to suits when they are put into a proper and legal form; and are distinguished in respect to the parties who plead them, by the names of bars, replications, rejoinders, sur-rejoinder, rebutters, &c.; and

though the matter in the declaration or count does not properly come under the name of pleading, yet, being often comprehended in the extended sense of the word, it is generally considered under this head. This is the technical sense of the word pleading, which is vulgarly applied to the public speaking of the advocates in the courts. The necessity of reducing the proceedings into writing gives rise to a great deal of business amongst barristers, which is called special pleading, and those who are skilled in this are distinguished particularly as pleaders. Of late years persons under the degree of barristers have drawn pleadings which are afterwards signed by barristers. These persons take very low fees, but when called to the bar engross a great share of business. Their habits bring them closely connected with attorneys.

PLEA'SANCE. *s.* (*plaisance*, French.) Gayety; pleantry: obsolete (*Spenser*).

PLEA'SANT. *a.* (*plaisant*, French.) 1. Delightful; giving delight (*Psalms*). 2. Grateful to the senses (*Milton*). 3. Good-humoured; cheerful (*Addison*). 4. Gay; lively; merry (*Rogers*). 5. Trifling; adapted rather to mirth than use (*Locke*).

PLEA'SANTLY. *ad.* (from *pleasant*.) 1. In such a manner as to give delight. 2. Gayly; merrily; in good humour (*Claren.*). 3. Lightly; ludicrously (*Broome*).

PLEA'SANTNESS. *s.* (from *pleasant*.) 1. Delightfulness; state of being pleasant. 2. Gayety; cheerfulness; merriment (*Tillotson*).

PLEA'SANTRY. *s.* (*plaisanterie*, French.) 1. Gayety; merriment (*Addison*). 2. Sprightly saying; lively talk (*Addison*).

To PLEASE. *v. a.* (*placeo*, Lat. *plaire*, Fr.) 1. To delight; to gratify; to humour (*Pope*). 2. To satisfy; to content (*Shakspeare*). 3. To obtain favour from: to be pleased with, is to approve; to favour (*Milton*). 4. To be PLEAS-ED. To like. A word of ceremony (*Dryden*).

To PLEASE. *v. n.* 1. To give pleasure (*Milton*). 2. To gain approbation (*Hosea*). 3. To like; to choose (*Pope*). 4. To condescend; to comply (*Shakspeare*).

PLEA'SER. *s.* (from *please*.) One that courts favour.

PLEA'SINGLY. *ad.* (from *pleasing*.) In such a manner as to give delight (*Pope*).

PLEA'SINGNESS. *s.* (from *pleasing*.) Quality of giving delight.

PLEA'SEMAN. *s.* (*please* and *man*.) A pickthank; an officious fellow (*Shakspeare*).

PLEA'SURABLE. *a.* (from *pleasure*.) Delightful; full of pleasure (*Bacon*).

PLEASURE. *s.* (*plaisir*, French.) 1. Delight; gratification of the mind or senses. See **HAPPINESS**. 2. Loose gratification (*Shakspeare*). 3. Approbation (*Psalms*). 4. What the will dictates (*Shakspeare*). 5. Choice; arbitrary will (*Brown*).

To PLEASURE. *v. a.* (from the noun.) To please; to gratify (*Tillotson*).

PLEASUREFUL. *a.* (*pleasure* and *full*.) Pleasant; delightful: obsolete (*Abbot*).

PLEASURE-GROUND, in gardening, any kind of ornamented ground surrounding a mansion or other residence. Whence the term comprehends all the embellishing compartments or divisions of ground and plantation, such as lawns, plantations of trees and shrubs, flower compartments, walks, pieces of water, &c. whether situated wholly within the space generally considered as proper pleasure-ground, or extended over ha-has or sunk fences, or by other communications to the adjacent fields, parks, paddocks, or out-grounds.

In designs for pleasure-grounds, modern improvements reject all formal works, as long straight walks, regular intersections, square grass-plots, corresponding parterres, quadrangular and angular spaces, inclosed with high clipped hedges, as well as all other uniformities. Instead of which, open spaces of grass ground of varied forms and dimensions, and winding walks, all bounded with plantations of trees, shrubs, flowers in various clumps, and other distributions are picturesquely exhibited in a variety of rural forms; as curves, projections, openings and closings, in imitation of natural assemblages, each of these being laid open to the walks and lawns. A broad expansive lawn of grass is usually placed immediately in the front of the mansion or main residence; sometimes widely extended in open space on both sides, to admit of a spreading prospect; and sometimes more contracted towards the habitation, widening gradually outward, and having each side embellished with shrubby plantations, groves, thickets, &c. in clumps; and in other parts in sweeps, curves, and projections towards the lawn, &c. with breaks or openings of grass spaces at intervals between the plantations; and serpentine gravel walks, winding under the shade of the trees: extended plantations being also carried round the outer boundary of the ground, in various openings and closings, having also gravel walks winding through them for shady retirement; while in the interior divisions of the ground serpentine walks take a meandering line, and elegant grass-plots occasionally open, ranging in various directions, all bordered with shrubberies, and other tree and shrub plantations, flower compartments, &c. each being so distributed as continually to give a change of scene and object.

The general intention therefore of modern pleasure-grounds is to unite the diversified beauties of art and nature; and if the surface be marked with inequalities and irregularities, an advantage is taken even of these deviations from uniformity, and instead of our being at the expense of squaring or levelling them, the natural forms are humoured, slightly smoothed where ruggedness would be inappropriate with the general character, and even increased in prominence, where a bold projecting and formidable contrast is demanded, or may be picturesquely introduced. The grand point of attention being at all times to take care that the whole range of the prospect is not exhausted at one view, and to give to every object, and

especially to every distant object, a perpetual change and novelty of shape and impression, by disclosing them in different attitudes or under different aspects.

It is impossible to lay down any precise plan upon this subject, since the arrangement must altogether depend upon the character and extent of the natural landscape, and the taste and judgment of the designer.

The mansion itself, however, should if possible be always erected in a situation somewhat elevated, or on the side of a moderate slope. Yet when this is not practicable,

E'en in the deep unseen, unseeing dell,

in the midst of flats and plains, an artist of taste and real genius may contrive to call forth a considerable range of pleasing and picturesque effect; relinquishing, however, as in such situations he ought uniformly to do, all attempts at the grand and the magnificent, letting the modest take the place of the bold, and the beautiful that of the sublime. Such pleasure-grounds are common to the midland counties of this country, and in many instances produce in the mind, not indeed so striking and instantaneous an effect as landscapes full of contrast, and gigantic abruptness of scenery, but often sweeter and more durable; full of repose and tranquillity.

PLEBEIAN, any person of the rank of the common people. The word is chiefly employed in speaking of the ancient Romans, who were divided into senators, patricians, and plebeians. The distinction was made by Romulus.

PLEBEI'AN. *a.* 1. Popular; consisting of mean persons (*King Charles*). 2. Belonging to the lower ranks (*Milton*). 3. Vulgar; low; common (*Bacon*).

PLECTANTHRUS, in botany, a genus of the class didynamia, order gymnospermia. Calyx with the upper division larger; corol reversed, ringent; the tube either gibbous or spurred upwards. Six species; natives of Asia or Africa.

PLECTRONIA, in botany, a genus of the class pentandria, order monogynia. Petals five, inserted into the throat of the calyx; berry two-seeded, inferior. One species; a tree of the Cape, with lance-ovate, very entire leaves; corymbed flowers.

PLECTRUM. The quill formerly used instead of the ends of the fingers in agitating the strings of various musical instruments.

PLEDGE. *s.* (*pleige*, French; *pieggio*, Ita.) 1. Any thing put to pawn. 2. A gage; any thing given by way of warrant or security; a pawn (*Rowe*). 3. A surety; a bail; an hostage (*Raleigh*).

To **PLEDGE**. *v. a.* (*pleiger*, French; *piegiare*, Italian.) 1. To put in pawn (*Pope*). 2. To give as warrant or security. 3. To secure by a pledge (*Shakspeare*).

To **PLEDGE**, in drinking, denotes to warrant, or be surety to one, that he shall receive no harm while he is taking his draught. The phrase is referred by our antiquaries to the

practice of the Danes heretofore in England, who frequently used to stab or cut the throats of the natives while they were drinking.

PLEDGES OF GOODS FOR MONEY. See **PAWN**.

PLEDGERY, or **PLEGGERY**, in law, suretiship, or an undertaking or answering for another.

PLEDGET, **BOLSTER**, or **COMPRESS**, in surgery, a kind of flat tent laid over a wound, to imbibe the superfluous humours, and to keep it clean.

PLEGORHIZA, in botany, a genus of the class enneandria, order monogynia. Calyxless; corol one-petalled; capsule one-celled, one seeded. One species; a native of Chili, with tufted oval petioled root-leaves, and terminal flowers.

PLEIADES, in fabulous history, the seven daughters of Atlas king of Mauritania and Pleione, were thus called from their mother. They were Maia, Electra, Taygete, Asterope, Merope, Halcyone, and Celeno; and were also called Atlantides, from their father Atlas. These princesses were carried off by Busiris king of Egypt; but Hercules having conquered him, delivered them to their father: yet they afterwards suffered a new persecution from Orion, who pursued them five years, till Jove, being prevailed on by their prayers, took them up into the heavens, where they form the constellation which bears their name.

PLEIADES, in astronomy, an assemblage of seven stars, in the neck of the constellation Taurus. They are thus called from the Greek *πλεῖν, navigare*, to fail; as being terrible to mariners, by reason of the rains and storms that frequently rise with them. The Latins called them *vergilia* from *ver*, spring; because of their rising about the time of the vernal equinox. The largest is of the third magnitude, and is called lucida pleiadum.

PLEIADES OF POETS. See **LYCOPHRON**.

PLEIONE, one of the Oceanides, who married Atlas, king of Mauritania, by whom she had twelve daughters, and a son called Hyas. Seven of the daughters were changed into a constellation called Pleiades, and the rest into another, called Hyades.

PLENARILY. *ad.* (from *plenary*.) Fully; completely (*Ayliffe*).

PLENARINESS. *s.* (from *plenary*.) Fullness; completeness.

PLENARY. *a.* (from *plenus*, Lat.) Full; complete (*Watts*).

PLENARY. *s.* Decisive procedure (*Ayliffe*).

PLENILUNARY. *a.* (from *plenilunum*, Lat.) Relating to the full moon (*Brown*).

PLENIPOTENCE. *s.* (from *plenus* and *potentia*, Lat.) Fulness of power.

PLENIPOTENT. *a.* (*plenipotens*, Latin.) Invested with full power (*Milton*).

PLENIPOTENTIARY. *s.* (*plenipotentiaire*, French.) A negotiator invested with full power (*Stillingfleet*).

PLENIST. *s.* (from *plenus*, Lat.) One that holds all space to be full of matter (*Boyle*).

PLENTITUDE. *s.* (*plenitudo*, from *plenus*, G G 2

Latin; *plenitudo*, French.) 1. Fulness; the contrary to vacuity (*Bentley*). 2. Repletion; animal fulness; plethory (*Arbuthnot*). 3. Exuberance; abundance (*Bacon*). 4. Completeness (*Prior*).

PLENTEOUS. *a.* (from *plenty*.) 1. Copious; exuberant; abundant (*Milton*). 2. Fruitful; fertile (*Genesis*).

PLENTEOUSLY. *ad.* Copiously; abundantly; exuberantly; plentifully (*Shakspeare*).

PLENTEOUSNESS. *s.* (from *plenteous*.) Abundance; fertility; plenty (*Genesis*).

PLENTIFUL. *a.* (*plenty* and *full*.) Copious; abundant; exuberant; fruitful (*Raleigh*).

PLENTIFULLY. *ad.* (from *plentiful*.) Copiously; abundantly (*Addison*).

PLENTIFULNESS. *s.* (from *plentiful*.) The state of being plentiful; abundance; fertility.

PLENTY. *s.* (from *plenus*, Latin, full.) 1. Abundance; such a quantity as is more than enough (*Locke*). 2. Fruitfulness; exuberance (*Thomson*). 3. It is used, I think barbarously, for *plentiful* (*Shakspeare*). 4. A state in which enough is had and enjoyed (*Joel*).

PLENUM, in physics, denotes, according to the Cartesians, that state of things wherein every part of space is supposed to be full of matter, in opposition to a vacuum, which is a space supposed devoid of all matter.

PLENUS FLOS, a full flower; a term expressive of the highest degree of luxuriance in flowers. Such flowers, although the most delightful to the eye, are both vegetable monsters, and, according to the sexualists, vegetable eunuchs; the unnatural increase of the petals constituting the first; the consequent exclusion of the stamina or male organs, the latter.

PLEONASM. *s.* (*pleonasmus*, Latin.) A figure of rhetoric, by which more words are used than are necessary usually, for the purpose of deepening the impression.

PLESH. *s.* (A word used by *Spenser* instead of *plash*.) A puddle; a boggy marsh.

PLESHEY, a village in Essex, seven miles N. by W. of Chelmsford. It was the seat of the lord high constable of England, from the earliest times of that office to the year 1400. On the site of his castle is now a brick farm-house; and here are the remains of an ancient fortification, consisting of a mount, of an oval form, surrounded by an area that contains about two acres, and is bounded by a rampart and ditch, over which is a brick bridge.

PLESSE, a town of Silesia, with a castle, seated on the Vistula, 36 miles E. of Troppaw. Lon. 18. 36 E. Lat. 50. 0 N.

PLETHORA. (*πλεθωρα*; from *πλεωω*, to fill.) Fulness of vessels. A redundancy of blood.

PLETHORETIC. *a.* (from *plethora*.) Having a full habit.

PLETTENBERG, a town of Westphalia, in the county of Mark, governed by its own magistracy. It is situate on the Else and

Oester, 28 miles S. of Ham. Lon. 7. 48 E. Lat. 51. 8 N.

PLEVIN. *s.* (*plevine*, Fr. *plevina*, law Lat.) In law, a warrant or assurance.

PLEURA. (*πλευρα*.) A membrane which lines the internal surface of the thorax, and covers its viscera. It forms a great process, the mediastinum, which divides the thorax into two cavities. Its use is to render the surface of the thorax moist by the vapour it exhales. The cavity of the thorax is every where lined by this smooth and glistening membrane, which is in reality two distinct portions or bags, which by being applied to each other laterally, form the septum called mediastinum: this divides the cavity into two parts, and is attached posteriorly to the vertebræ of the back; and anteriorly to the sternum. But the two laminae of which this septum is formed, do not every where adhere to each other; for at the lower part of the thorax they are separated to afford a lodgement to the heart, and at the upper part of the cavity they receive between them the thymus. The pleura is plentifully supplied with arteries and veins from the internal mammary, and the intercostals. Its nerves, which are very inconsiderable, are derived chiefly from the dorsal and intercostal nerves. The surface of the pleura, like that of the peritonæum and other membranes lining cavities, is constantly bedewed with a serous mixture, which prevents adhesions of the viscera. The mediastinum, by dividing the breast into two cavities, obviates many inconveniences to which we should otherwise be liable. It prevents the two lobes of the lungs from compressing each other when we lie on one side, and consequently contributes to the freedom of respiration, which is disturbed by the least pressure on the lungs. If the point of a sword penetrate between the ribs into the cavity of the thorax, the lungs on that side cease to perform their office, because the air being admitted through the wound, prevents the dilatation of that lobe, while the other lobe, which is separated from it by the mediastinum, remains unhurt, and continues to perform its functions as usual.

PLEURISY. *s.* (*πλευριτις*.) An inflammation of the pleura, or membrane that lines the cavity of the breast (*Quincy*).

PLEURITICAL. *a.* (from *pleurisy*.) 1. Diseased with a pleurisy (*Arb.*). 2. Denoting a pleurisy (*Wiseman*).

PLEURITIS. (*πλευριτις*, from *πλευρα*, the membrane lining the lungs.) Pleurisy, or inflammation of the pleura. A species of pneumonia of Cullen. See **PNEUMONIA**. In some instances the inflammation is partial, or affects one place in particular, which is commonly on the right side; but in general, a morbid affection is communicated throughout its whole extent. The disease is occasioned by exposure to cold, and by all the causes which usually give rise to all inflammatory complaints; and it attacks chiefly those of a vigorous constitution and plethoric habit. In

consequence of the previous inflammation, it is apt at its departure to leave behind a thickening of the pleura, or adhesions to the ribs and intercostal muscles, which either lay the foundation of future pneumonic complaints, or render the patient more susceptible of the changes in the state of the atmosphere than before.

It commences with an acute pain in the side, which is much increased by making a full inspiration, and is accompanied by flushing in the face, increased heat over the whole body, rigours, difficulty of lying on the side affected, together with a cough and nausea, and the pulse is hard, strong, and frequent, and vibrates under the finger when pressed upon, not unlike the tense string of a musical instrument. If blood is drawn and allowed to stand for a short time, it will exhibit a thick sily or buffy coat on its surface. If the disease be neglected at its onset, and the inflammation proceeds with great violence and rapidity, the lungs themselves become affected, the passage of the blood through them is stopped, and the patient is suffocated; or from the combination of the two affections, the inflammation proceeds on to suppuration, and an abscess is formed. The prognostic in pleurisy must be drawn from the severity of the symptoms. If the fever and inflammation have run high, and the pain should cease suddenly, with a change of countenance and a sinking of the pulse, great danger may be apprehended; but if the heat and other febrile symptoms abate gradually; if respiration is performed with greater ease and less pain, and a free and copious expectoration ensues, a speedy recovery may be expected.

The appearances on dissection are much the same as those mentioned under the head of pneumonia, viz. an inflamed state of the pleura, connected with the lungs, having its surface covered with red vessels, and a layer of coagulated lymph lying upon it, adhesions too, of the substance of the lungs to the pleura. Besides these, the lungs themselves are often found in an inflamed state, with an extravasation either of blood or coagulated lymph in their substance. Tubercles and abscesses are likewise frequently met with.

PLEURODYNIA. (*πλευροδυνία*; from *πλευρα*, and *δυνι*, pain.) A pain in the side, from a rheumatic affection of the pleura.

PLEURONECTES. Flat-fish. In zoology, a genus of the class pisces, order thoracica. Head small; eyes spherical, both on the same side of the head, and near each other; mouth arched; jaws unequal, toothed; gill-membrane with from four to seven rays; the cover mostly of three laminae; body convex, and coloured above; flat and paler beneath; vent near the head.

This genus, including those which are usually denominated flat-fishes, embraces the turbot, sole, holibut, plaice, flounder, pearl, and whiff. These swim constantly obliquely, and reside at the bottom of the water, from their wanting the air-bladder; they often bury

themselves in the sand as far as the head, by which they escape the jaws of the more rapacious tribes: the eyes are covered with a nictitant membrane; nostrils double and contiguous; belly without ribs; fins soft and mostly with simple rays, the ventral and pectoral long; the tail generally rounded, with bifid rays. Twenty-nine species, thus subdivided:

A. Eyes both on the right side of the head.

Seventeen species.

B. Eyes both on the left side of the head.

Twelve species.

The species of this genus are scattered through the seas of the globe generally: chiefly, however, those of Europe and America. About twelve species are found near our own coasts. The following are those most worthy of notice.

1. *P. platessa*. Plaice. Body smooth; behind the left eye a row of six tubercles reaching to the lateral line: head covered with firm scales, each deposited in its proper bed; eyes moderate, pupil blueish, iris greenish-yellow; mouth small; teeth small, obtuse; tail scaly at the base, with all the rays longer than the membrane. Inhabits British and other European seas; grows to sixteen pounds weight; body often varied with brown and cinereous, with large bright orange spots, beneath white; flesh good.

2. *P. hippoglossus*. Holibut. Body perfectly smooth; tail lunate.

This species is called in Scotland turbot, though different from the fish known in England by that name. It is the largest of all the aquatic animals except the whale tribe, and is sometimes found on our shores three hundred pounds weight, while those in the seas of Iceland and Newfoundland greatly exceed even that size. In Greenland they are also caught of a prodigious bulk, with the hook and line, off these bold shores: where they are cut up into large slips, and dried for food to the inhabitants. The holibut is also common in the London market; but where there is such an abundant variety to choose, they are deemed a coarse unsavoury fish, excepting the part which adheres to the side fins, which is fat and luscious.

The colour above is an obscure green, bordering upon black; that of the belly a pure white. The scales are small, and the body all over free from spines; even the edges of the fins have no asperity from the projection of the rays. The eyes are upon the left side of the mouth, and the right of the animal. The fin which runs along the back begins above the eyes, and terminates about two inches from the tail; that upon the belly has its origin about seven inches from the point of the rostrum, and terminates in the same manner. There are two pectoral fins and six small ones on the belly.

3. *P. maximus*. Turbot. Body rough. This species is an excellent food, and grows to a great size, weighing from twenty to thirty pounds. The skin is entirely destitute of scales, but is granulated, and has different asperities

here and there dispersed over it. The whole upper part of the body, together with the head and fins, is cinereous, and thick set with a variety of black spots. The jaws are not furnished with a single row of teeth, as in the other species, but are armed with a vast number of small ones; as also the palate. The eyes are placed on the left side, not so near the edge of the back, nor so close to one another, as in the rest. The dorsal fin takes its origin farther forward than usual, beginning near the upper part of the mouth, and extending till it nearly reaches the tail.

The turbot fishery is carried on to the greatest extent on the north coasts of England and of Holland. These fishes are most successfully caught by the hook and line; the method practised by staked nets being very uncertain. The fishermen of Scarborough are most expert in this business. They go out in large cobbles, with three men in each; and every fisher has three lines, furnished with two hundred and eighty hooks apiece. The lines, before shooting, are all joined together, when they extend about three miles, and are fastened with buoys and anchors. They are drawn at every turn of the tide, the rapidity of the current preventing at any other time.

4. *P. solea*. Sole. Body oblong, rough; upper jaw longer. Inhabits European and Mediterranean seas: sometimes above two feet long; body narrow, above olive; scales small, hard, denticulate, very firmly adhering to the skin: flesh good, and next to the turbot considered as the most delicate of the whole tribe: those of moderate size are in general most esteemed. The sole delights in lying at the bottom of the coasts which it frequents, preying on small shell-fishes, spawn, sea-insects, &c. and is generally taken by the trawl net. The chief fishery, according to Mr. Pennant, is at Brixham in Torbay.

5. *P. flossus*. Flounder. Lateral line rough; short spines on the right side of the fins. Inhabits European seas, and even enters rivers far above the salt waters; seldom exceeds six pounds weight; body covered with thin oblong scales, firmly sticking to the skin; above pale-brown with dirty yellow spots, beneath white shaded with brownish.

6. *P. limanda*. Dab. Scales small, ciliate; spinules at the root of the dorsal and anal fins with obtuse teeth. Inhabits European seas; less and thinner than the flounder; feeds on worms and insects, especially small crabs; spawns in June; body mucous, above dark liver-colour, beneath white; scales soft, oblong, sticking firmly to the body; flesh very good.

7. *P. lævis*. Smear-dab. Brown, with obscure yellow spots, beneath white, with five large dusky spots; scales smooth; dorsal fin seventy-five-rayed. Inhabits Europe; one and a half foot long; flesh very good.

8. *P. rhombus*. Pearl. Body smooth. Inhabits the European seas; is the broadest of its size except the turbot; body covered with small scales, deep-brown with dirty yellow

spots, beneath white; flesh very good, but inferior to the turbot.

9. *P. passer*. Whiff. Lateral line much curved, prickly. Inhabits European seas; hardly a foot long; body oblong, smooth, covered with thin scales, above varied with cinereous and yellow, beneath white; flesh very good.

PLEURO-PNEUMONIA. (πλευρο-πνευμονία; from πλευρα, and πνευμονια, an inflammation of the lungs.) An inflammation of the lungs and pleura.

PLEXIPPUS. The most remarkable of this name was a son of Theseus, brother to Althæa, the wife of Ceneus. He was killed by his nephew Meleager, in hunting the Calydonian boar. His brother Toxens shared his fate.

PLEXUS. (from *plector*, to plait or knit.) A net-work of vessels. The union of two or more nerves is also called a plexus.

PLEXUS (Cardiac). See **CARDIAC PLEXUS**.

PLEXUS (Choroides). See **CHOROID PLEXUS**.

PLEXUS (Oesophageal). See **OESOPHAGEAL**.

PLEXUS (Pulmonic). See **PULMONIC PLEXUS**.

PLEYBERG, a town of Germany, in Carinthia, seated on the Feistez, at the foot of a mountain, 25 miles E. by S. of Clagenfurt.

PLIABLE. *a.* (*pliable*, from *plier*, Fr.) 1. Easy to be bent; flexible (*South*). 2. Flexible of disposition; easy to be persuaded.

PLIABLENESS. *s.* (from *pliable*.) 1. Flexibility; easiness to be bent. 2. Flexibility of mind (*South*).

PLI'ANCY. *s.* (from *pliant*.) Easiness to be bent (*Addison*).

PLI'ANT. *a.* (*pliant*, French.) 1. Bending; tough; flexible; flexible; lithe; limber (*Addison*). 2. Easy to take a form (*Dryd.*). 3. Easily complying (*Bacon*). 4. Easily persuaded (*South*).

PLIANT MEALY TREE. See **VIBURNUM**.

PLI'ANTNESS. *s.* (from *pliant*.) Flexibility; toughness (*Bacon*).

PLICA POLONICA. (from *plico*, to entangle. This disease is commonly distinguished by the adjective *polonica*, it being peculiar to the inhabitants of Poland and Lithuania.) Trichoma. A disease of the hairs, in which they become long and coarse, and matted and glued into inextricable tangles. It is peculiar to Poland and Tartary, and generally appears during the autumnal season.

PLICATE, in botany, plaited: applied to the leaves of plants.

PLICATION. **PLI'CATURE.** *s.* (*plicatura*, from *plico*, Latin.) Fold; double.

PLIERS. *s.* (from *ply*.) An instrument by which any thing is laid hold on to bend it.

To PLIGHT. *v. a.* (*plichten*, Dutch.) 1. To pledge; to give as surety (*Shakspeare*). 2. (from *plico*, Lat.) To braid; to weave (*Spenser*).

PLIGHT. *s.* (*plhtz*, Saxon.) 1. Condition;

state (*Shakspeare*). 2. Good case (*Tusser*). 3. Pledge; gage (from the verb.) (*Shakspeare*). 4. (from *to plight*.) A fold; a pucker; a double; a puffle; a plait (*Spenser*).

PLINIA, in botany, a genus of the class icosandria, order monogynia. Calyx four or five-parted; petals four or five; drupe superior, grooved. One species only; an American tree, with pinnate leaves; scattered sessile flowers; and an eatable fruit.

PLINTH. *s.* (πλινθίς.) In architecture, a flat square member, in the form of a brick. It is used as the foundation of columns, being that flat square table, under the moulding of the base and pedestal at the bottom of the whole order. It seems to have been originally intended to keep the bottom of the original wooden pillars from rotting.

PLINTH OF A STATUE, &c. is a base, either flat, round, or square, that serves to support it.

PLINTH OF A WALL, denotes two or three rows of bricks advancing out from a wall; or, in general, any flat high moulding, that serves in a front wall to mark the floors, to sustain the eaves of a wall, or the larmier of a chimney.

PLINY the Elder (*Plinius Secundus*), was born at Verona, of a noble family. He distinguished himself in the field, and, after he had been made one of the augurs at Rome, he was appointed governor of Spain. In his public character he did not neglect the pleasures of literature; the day was employed in the administration of the affairs of his province, and the night was dedicated to study. If his literary pursuits made him forget public affairs, his prudence, and his abilities, made him known and respected. He was courted and admired by the emperors Titus and Vespasian. As he was at Misenum, where he commanded the fleet, which was then stationed there, he was surprised at the sudden appearance of a cloud of dust and ashes which issued from mount Vesuvius. His curiosity then led him to make some observation thereon, and having approached the mountain, he was, before he could effect an escape, suffocated by the thick vapours that surrounded him, and the insupportable stench of sulphureous matter. His body was found three days after, and decently buried. This memorable event happened in the 79th year of the Christian era, and the 56th year of his age. Of the works which he composed none are extant but his *Natural History* in 37 books. It treats of the stars, the heavens, wind, rain, hail, minerals, trees, flowers, and plants, besides the account of all living animals, birds, fishes, and beasts; a geographical description of every place on the globe, and an history of every art and science, of commerce and navigation, with their rise, progress, and several improvements.

Of the *Natural History* there have been several editions. The editio princeps, printed at Venice in 1469, is one of the most beautiful and valuable publications of the 15th century. Jenson's edition, printed at Venice in 1472, is

very splendid and curious, but it is not free from interpolations. The Aldine edition of Paul Manutius, in 4 vols. 8vo. printed at Venice in 1536, is characterised by De Bure, as "Edition fort belle, peu commune, et recherchée avec raison, de ceux qui aiment les éditions de cet imprimeur." The edition of Crispinus printed at Geneva, in 1631, is called by Dibdin "a work beyond all praise." Besides these, the Elzivir variorum edition of 1669, father Harduin's, of 1723, the Leipsic edition of 1778—91, and those of Brotier and the Bipont editors, are very useful and esteemed publications.

PLINY the Younger, or *C. Cæcilius*, was son of *L. Cæcilius* by the sister of *Pliny the Elder*. He was adopted by his uncle, whose name he assumed. He received the greatest part of his education under *Quintilian*, and, at the age of 19, he appeared at the bar, where he distinguished himself so much by his eloquence, that he, and *Tacitus*, were reckoned the two greatest orators of their age. He published many of his harangues and orations, which have been lost. He presided over *Pontus* and *Bithynia*, in the office of pro-consul, and, by his philanthropy, the persecution begun against the christians of his province was stopped, when he declared to the emperor that the followers of *Christ* were a meek and inoffensive sect of men. If he rendered himself popular in his province, he was not less respected at Rome, as being the friend of the poor, and the patron of learning. He died in the 52d year of his age, *A. D.* 113. He had written an history of his own times, which is lost. Some suppose, but falsely, that *Pliny* wrote the lives of illustrious men, universally ascribed to *Cornelius Nepos*. He also wrote poetry, but his verses have all perished, and nothing of his learned works remains but his panegyric on the emperor *Trajan*, and 10 books of letters, which are written with elegance and great purity. These letters are esteemed by some equal to the voluminous epistles of *Cicero*.

The editio princeps of the Letters in folio, date 1471, without name of printer or place, is a very magnificent work. The Naples edition of 1476 is rare and very beautiful. *H. Stephens'* editions, Paris 1581, Geneva 1591, are elegant and valuable. The Elzivir edition of 1640 contains also the Panegyric, and is an accurate and beautiful little work. Besides these, the editions of *Thomasius*, in 1675, of *Longolius*, in 1734, and *Henry Homer's*, published by *Payne*, in 1790, are much and deservedly esteemed. The Epistles have also been elegantly translated by *Orrery* and *Melmoth*. Of the Panegyric we need only mention the editio optima by *Swarz*, published at Nuremberg in 1746. Its great merits are universally known and acknowledged amongst classical scholars.

PLISTHENES, a son of *Atræus*, king of *Argos*, father of *Menelaus* and *Agamemnon*, according to *Hesiod* and others. *Homer*, however, calls *Menelaus* and *Agamemnon* sons of

Atræus. The father died very young, and the two children were left in the house of their grandfather, who took care of them and instructed them. From his attention to them, Atræus was universally acknowledged their protector and father.

PLISTOANAX and **PLISTONAX**, son of Pausanias, was general of the Lacedæmonian armies in the Peloponnesian war. He was banished from his kingdom of Sparta for 19 years, and was afterwards recalled by order of the oracle of Delphi. He reigned 58 years.

PLOCAMA, in botany, a genus of the class pentandria, order monogynia. Calyx five-toothed, superior; corol campanulate, five-cleft; berry three-celled, the cells one-seeded. One species, a pendulous plant of the Canaries.

PLOCKSKO, a town of Poland, capital of a palatinate of the same name, with a castle, and a bishop's see. It is seated on a hill, near the Vistula, 45 miles E.S.E. of Uladislav, and 75 N.W. of Warsaw. Lon. 19. 29 E. Lat. 52. 46 N.

To PLOD. *v. n.* (*ploeghen*, Dutch. *Skinner.*) 1. To toil; to toil; to drudge; to travel. 2. To travel laboriously (*Shakspeare*). 3. To study closely and dully (*Hudibras*).

PLODDER. *s.* (from *plod*.) A dull heavy laborious man (*Shakspeare*).

PLOEN, a town of Lower Saxony, in the duchy of Holstein, capital of a principality of the same name. It is seated on the N. side of a lake, 22 miles N.W. of Lubec. Lon. 10. 20 E. Lat. 54. 11 N.

PLOERMEL, a town of France, in the department of Morbihan, 27 miles N.E. of Vannes. Lon. 2. 30 W. Lat. 47. 57 N.

PLOMO, in metallurgy, is a name given by the Spaniards, who have the care of the silver-mines, to the silver-ore, when found adhering to the surface of stones, and when it incrusts their cracks and cavities like small and loose grains of gunpowder. Though these grains be few in number, and the rest of the stone have no silver in it, yet they are always very happy when they find it, as it is a certain token that there is a rich vein somewhere in the neighbourhood.

PLOT. *s.* (*plotz*, Saxon.) 1. A small extent of ground (*Tusser*). 2. A plantation laid out (*Sidney*). 3. A form; a scheme; a plan (*Spenser*). 4. A conspiracy; a secret design formed against another (*Daniel*). 5. An intrigue; an affair complicated, involved, and embarrassed (*Roscommon*). 6. Stratagem; secret combination to an ill end (*Milton*). 7. Contrivance; deep reach of thought.

To PLOT. *v. n.* (from the noun.) 1. To form schemes of mischief against another (*Dryden*). 2. To contrive; to scheme (*Wotton*).

To PLOT. *v. a.* 1. To plan; to contrive (*Dryden*). 2. To describe according to ichnography.

PLOT (Robert), a learned antiquary, born at Sutton Barn, Kent, in 1641, and educated at Oxford, where he took his degree of LL.D. in 1671. He was secretary to the royal society,

and published their philosophical transactions from No. 143 to 166 inclusive: he was professor of chemistry at Oxford; keeper of the Ashmolean Museum, and historiographer to James II. also Mowbray herald extraordinary. He wrote the natural history of Oxfordshire and Staffordshire, in folio, besides several pieces in the philosophical transactions. He died of the stone in 1696.

PLOTINA POMPEIA, a Roman lady who married Trajan while a private man. She distinguished herself by her humanity, and liberal offices to the poor and friendless. She accompanied Trajan in the east, and upon her return to Rome with the ashes of her husband, she still enjoyed all the honours of a Roman empress under Adrian. At her death, A. D. 122, she was ranked among the gods, and received divine honours.

PLOTINOPOLIS, a town of Thrace, built by the emperor Trajan, and called after Plotina, the founder's wife.—Another in Dacia.

PLOTINUS, a Platonic philosopher of Lycopolis in Egypt. He was for eleven years a pupil of Ammonius the philosopher, after which he determined to visit India and Persia to receive information. He accompanied Gordian in his expedition into the east, but was obliged to save himself by flight, and the following year he retired to Rome, where he publicly taught philosophy. His school was frequented by people of every sex, age, and quality. He was the favourite of all the Romans; and while he charmed the populace by the force of his eloquence, and the senate by his doctrines, the emperor Gallienus courted him, and admired the extent of his learning. The philosopher having at last become helpless and infirm, died A. D. 270, in the 66th year of his age. His writings have been collected by his pupil Porphyry. They consist of 54 different treatises divided into six equal parts, written with great spirit and vivacity; but the reasonings are abstruse, and the subjects metaphysical.

Ficinus is the principal editor of Plotinus: the only editions we have heard of are those of 1492, 1580, and 1615.

PLOTTER. *s.* (from *plot*.) 1. Conspirator (*Dryden*). 2. Contriver (*Shakspeare*).

PLOTTING, among surveyors, is the art of laying down on paper, &c. the several angles and lines of a tract of ground surveyed by a theodolite, &c. and a chain. In surveying with the plain table, the plotting is saved; the several angles and distances being laid down on the spot, as fast as they are taken. (See **PLAIN-TABLE**.) But, in working with the theodolite, semicircle, or circumferentor, the angles are taken in degrees; and the distances in chains, and links, so that there remains an after-operation to reduce these members into lines, and so to form a draught, plan, or map; this operation is called plotting. Plotting then is performed by means of two instruments, the protractor and plotting scale. By the first, the several angles observed in the field with a theodolite, or the like, and entered

down in degrees in the field book, are protracted on paper in their just quantity. By the latter, the several distances measured with the chain, and entered down in the like manner in the field book, are laid down in their just proportion. See SURVEYING.

PLOTTING-SCALE, a mathematical instrument, usually of wood, sometimes of brass, or other matter; and either a foot or half a foot long. On one side of the instrument are seven several scales, or lines, of equal parts, to enable the plotter to lay down his dimensions of different sizes.

PLOTUS. Darter. In zoology, a genus of the class aves, order anseres. Bill straight, pointed, toothed; nostrils a little slit near the base; face and chin naked; legs short, all the toes connected. These have a small head and long, slender neck, and are chiefly seen in southern climates; they live principally on fishes, which they take by darting forward the head while the neck is contracted like the body of a serpent. Three species, as follow:

1. *P. aninga*. White-bellied darter. Head smooth; belly white; head, neck, and breast, reddish-grey; body above black, the scapular feathers with a white spot in the middle; tail-feathers twelve, broad, long; legs yellowish-ash. Inhabits Brazil; two feet ten inches long; builds on trees, and is hardly ever seen on the ground; when at rest, sits with the head drawn in between the shoulders; flesh oily and rancid.

2. *P. melanogaster*. Black-bellied darter. Head smooth; belly black. Inhabits Ceylon and Java; about three feet long. There are three or four other varieties from variation of colour, found in Cayenne and up the Senegal.

3. *P. Surinamensis*. Surinam darter. Head crested; belly white. Inhabits Surinam; thirteen inches long; is domesticated; and feeds on fishes, and insects, especially flies, which it catches with great dexterity: is very active.

PLOTZKAU, a town of Upper Saxony, in the duchy of Anhalt Bernberg, 24 miles W.S.W. of Dessau. Lon. 11. 45 E. Lat. 51. 48 N.

PLOVER, in ornithology. See **CHARADRIUS**.

PLOVER (Bastard). See **TRINGA**.

PLOUGH, in agriculture, a machine for breaking or turning up the soil, by the draught of cattle; and which, in general, consists of a train or carriage, furnished with two large irons (the one being pointed, while the other has a sharp edge), that serve both to cut or open, and also to draw furrows in the land.

"Ye generous Britons, venerate the plough,
And o'er your hills and long withdrawing vales,
Let autumn spread her treasures to the sun."

THOMSON.

No implement has more essentially contributed to the comforts of mankind than the plough; for without this contrivance, much time, labour, and expence, would be wasted in digging the ground, and preparing it for the reception of seed. Hence, ingenious men have invented a variety of ploughs, many of which are at present

employed by British farmers; and the more important of which we have already noticed in the article **HUSBANDRY**. We shall in this place therefore only add a few observations that have occurred to us since that article was composed.

The *Rotherham plough*, independently of Mr. Cooke's improvement already noticed in the article referred to, has been otherwise improved by Mr. Small, of Rosebank; who, we understand, has obtained a patent for his contrivance. In its present state, the wood-work is composed of ash or elm; and the plough differs from that commonly used, chiefly in the bridle, with which it is furnished at the end of the beam: this enables the ploughman to give the implement a more effectual power of action, and also by means of certain holes that are made in the beam, to cut the soil to a greater or less depth, as occasion may require. Another peculiarity that distinguishes this from the common plough, consists in the coulter and share, which are so constructed, and fixed, as to cut off the new furrow, without tearing it. Lastly, according to Mr. Small's plan, the mould-board being a plate of cast-iron, is so curved as to make less resistance to the earth turned up, and consequently requires a smaller force to draw it, than the common ploughs; while the furrow is gradually laid over to its proper position.—This plough is not provided with wheels; is light and convenient; it costs, we believe, from 40 to 50s.; and deserves to be introduced into the southern counties.

The *Kentish turn-wrest plough* consists of an oak beam, about ten feet in length, five inches in depth, and four inches in breadth; to the end of which is tenoned a foot, or piece of timber ($3\frac{1}{4}$ feet long, 4 inches thick, and $3\frac{1}{2}$ inches broad) that is mortised at the bottom, to the end of the chep. The handles are fixed on the top of the beam, through which, at the distance of two feet five inches from the foot, is passed a sheath of oak, seven inches in width, and an inch and a half thick, being mortised into the chep in an oblique direction, so that the point of the share will be two feet ten inches asunder from the beam. The chep is five feet in length, four inches in width, and five deep: to this is fixed the share, which weighs about 32lbs. and is manufactured of hammered iron, being one foot eight inches in length, and from four and a half to seven inches wide at the point. The upper end of the beam is supported on a carriage, furnished with two wheels, that are three feet two inches in height; on the axle-tree of which a galloway is placed, and provided with a sliding bolster, for the purpose of raising or lowering the machine. A clasp-iron likewise enters through the axle, to which a strong chain, or a tow passing over the beam, is fixed in such a manner, that the plough may, by means of notches, or a pin known under the name of a check, be let out to a greater length from the axle; and will consequently penetrate more deeply into the earth.

We have been induced to give this description of the Kentish plough, because it is an instrument of great strength, and eminently calculated for rocky and hilly countries, as it turns the soil to a considerable depth, laying it perfectly level, without making any furrow, or opening; a circumstance of equal advantage and importance, in dry situations.—The price of the whole, with its tackle complete for drawing, is computed to be about five guineas.

PLOUGH.

A valuable implement has very lately been introduced into the county of Lancaster, by Mr. Duckett, jun.—It is denominated a *trench-plough*, and is furnished with two shares, one being directly over the other, so that one narrow superficial furrow may be drawn from the surface of the soil, while another, at a moderate depth, is taken off beneath. This machine is well adapted for ploughing in green crops, or long dung, by way of manure; and, if the surface of the soil be foul, it may be turned under, and fresh soil brought up, from the depth of 10 inches, by employing three horses. The earth being thus loosened, the roots of plants are enabled to strike downwards without any impediment; and, while the land is drained, and exposed to the influence of the air, it is thereby considerably improved.

The *scalp-plough* or *extirpator*, as it is generally termed, was not long since invented by Mr. Hayward, of Stoke-Ash, in the county of Suffolk. Its beam is seven feet in length, and is furnished with two handles. The shares are eight inches broad, nine in length, and are fixed to stalks, about ten inches in height, and eleven inches asunder. Such implement may be adapted to the wheels of a common plough, and will penetrate the soil to a greater or less depth, in a similar manner. The object of this contrivance is, the eradication of weeds, and the clearing of ploughed lands for seed; in which respect it is said to be more serviceable than any other instrument. Before the extirpator is employed the soil ought to be once ploughed; and, if it have lain fallow during a summer, the scalp is passed over it, twice: namely, the first time about two inches deep, and the next, in a transverse direction, at the depth of about four inches. This operation, together with harrowing the ground once, will not only destroy all weeds, but will pulverize and prepare the soil for the reception of seed, whether drilled, or broad-cast. Farther, if lands, intended for the production of spring-crops, be ploughed in autumn, and the extirpator be afterwards passed over them, they will be rendered fit for immediate sowing.—This machine may be drawn either by two or by three horses, according to the nature of the soil, and the depth required: it possesses the peculiar advantage, that it may be worked on all arable lands, by any person capable of directing a plough, and that it will turn over an acre of ground in one hour, without fatiguing either horses or oxen.—Should the soil, however, be over-run with weeds, it will be advisable to plough it with the scalp, twice; and, in some cases, three times; a short space being allowed to intervene, with a view to deprive the weeds of their vegetating power.

Among the most valuable implements that have, within a few years, been constructed and adopted in this country, is the *Beverstone plough*, designed, or at least improved, by the ingenious Mr. Lewin Tugwell, of Beverstone, in the county of Gloucester. The diameter of the wheel is one foot, nine inches; the breadth at the heel, nine inches; breadth of the fin, seven inches; top of beam at the heel to the ground, eight inches and a half; the mould-board projects at the top more than the breadth at the heel, six inches; from the heel to the tuck-hole of the share, two feet, six inches and a half; and from the tuck-hole to the point of the share, eight inches and a half.

This excellent machine, which considerably varies from the Rotherham, and other valuable ploughs, gained the prize at the ploughing-match in 1798, held near Pipers-Inn, Somersetshire,

under the patronage of the Bath and West of England society. It may be easily worked by a pair of oxen, without a driver; and, on account of its simplicity, we believe that the representation, above given, will be sufficient to guide a skilful carpenter, in the construction of a similar implement.

The *double*, or *two-furrow swing* and *wheel-plough*, demands the attention of every enlightened agriculturist: we have therefore subjoined the following description, copied from the 21 vol. of Communications to the Board of Agriculture.

This machine, we understand, was originally invented by Mr. Duckett, but has lately been materially improved by the patriotic lord Somerville. The construction of the beam is nearly the same as that of the Beverstone plough; which his lordship (in his address to the board, in 1798) acknowledges himself to have adopted, from a consciousness of his inability to substitute any other better adapted to the purpose. The chief and most important improvement relates to the mould-board, one end of which was formerly cut off, and the deficiency supplied by driving in wedges, to the consequent injury of the mould-plate. As this expedient, however, was attended with much trouble, it was generally omitted; and consequently, the land imperfectly tilled. With a view to remedy such inconvenience, lord S. proposes (after the mould-board is formed, and the plate is fitted in the usual manner) to cut a part of it off, and to connect the part thus separated with the fixed part of the board by means either of flat hinges, or of thin, flexible plates of hard-hammered iron; so that those parts may be easily set to have different inclinations with such fixed part, by the aid of two screws that pass from the inside through the lower parts of the handle of the plough, opposite to the backs of the moveable pieces. The screws, he observes, may be so regulated as to keep such pieces at any degree of inclination that may be required, according to the nature of the land intended to be broken up.

The two-furrow plough is best adapted to light, and level soils, particularly for stirring ley-grounds; and, as these cannot be laid too flat or seed-earths be turned too much on an edge, the plough may be adapted to either purpose with the utmost facility, by this improvement of the mould-board. When the moveable parts, above alluded to, are screwed outwards, a proportionate convexity or elevation will be left at the base of the furrow; and thus more earth will be exposed for covering the seed. Lastly, his lordship directs that the part of the mould-plate most liable to wear off by repeated friction be made twice as thick as the other parts of the plate, viz. double "the thickness of a new crown-piece," or about one-fourth of an inch; in which case it will remain unimpaired nearly as long as the whole of the machinery.

Lord S. observes, that "the principle of this moveable plate may not at first catch the attention of every reader;" but it deserves to be generally adopted, and has indeed met with strong advocates in ploughmen: for it not only relieves their right arm of considerable labour, that must otherwise be performed in wedging and hammering mould-plates; but much exertion is also saved to the right leg, in attempting to tread those furrows flat, which had been left on an edge by the plough. Lastly, these plates are indispensably necessary, in order to qualify two-furrow ploughs for all broad work, and particularly brack-

PLOUGH.

ing up leys; and such implements ought (in the technical phrase) to work on their own base, close at heel; as otherwise the furrow will be irregularly laid, and they will be immediately "thrown out of work."

Before we conclude the account of this valuable contrivance, it is but justice to state the result of a trial made at Kew, in March 1799, on his majesty's farm, in consequence of a challenge given to Lord Somerville. The quantity of land, till then in a state of nature, amounted to 17½ statute acres, and was worked by this implement, four Devonshire oxen (six years old), and a man, with a boy as driver, in six days and four hours. The cattle were in good condition when they commenced the task; after the accomplishment of which, they appeared in better order than before. They were allowed no corn; consumed every day, upon an average, about 40lbs. of hay, during their continuance at Kew; and worked eight hours each day, including half an hour for bait.—The land, thus tilled, was viewed by many gentlemen, and able agriculturists, who highly approved of it, and were induced to order numbers of these ploughs; a conduct which, we trust, will at length be generally adopted.

The two-furrow plough has, indeed, been introduced into some of the midland counties, where it is employed with five horses and one man, in tolerably level soils, which it divides as effectually as two single ploughs.—It is also used, together with the single-wheel plough, in Staffordshire; as it requires only a lad to drive the horses, and to turn the plough at the end of the furrow.—For breaking up the turf, an iron flay is screwed to the coulter; by which the sward is cut off, and turned into the furrow, so as to be covered with earth. Thus, by the aid of an additional horse, the soil will resemble a fallow, and may be harrowed with equal facility.

One of the latest British ploughs, which merits particular notice, is that invented by Mr. J. Turner, jun. of Bockleton, Warwickshire; and of which the following description may convey some idea.

A strong piece of wood, denominated by the inventor a wing, projects in the middle; and in this one of the coulters is fixed. This piece of timber is fastened, at a proper distance from the ear or hook at the end of the beam, to the side of the beam, by means of long screws passing throughout the latter; with the opposite side of which they connect another wing, containing a second coulter.—These two coulters are placed in a parallel direction, and are both strengthened with a piece of iron, called the stay; one end of which is fixed about two inches beneath the wing, and the other is inserted in the wing itself.

The lower extremity of the plough is formed of a drock or piece of wood about six inches in width, three in depth, and rather more than two feet in length.—To the top of the drock is fastened an erect piece of timber known by the name of spindle, and behind are two tails.—To the upper end of the spindle is fixed the beam, the end of which is fastened between the tails, by means of an iron pin.

Connected with the drock and spindle are two shelfe-boards, which meet at an angular point. The ends of both these boards are strengthened by means of a short wooden stay, that is fixed in them, as well as in the tails.

A third coulter is fastened to the share, and

is bent at the end, in order that it may be more easily admitted through a hole in the beam, behind the other two coulters, when the share is put on the end of the drock.

The object of this contrivance is the formation of small drains or gutters in meadows, and pasture-land, with a view to carry off stagnant waters: which, by remaining on the surface, materially injure the soil.—To adjust the plough for work, a mark is first made in the middle of that end of the drock, which is contiguous to the tails; when a straight line is traced on a level spot of ground, on which such mark and the point of the share are put, and made to coincide. From this line the fore-coulters must be equi-distant.

The most effectual method of working this plough is, in the opinion of its inventor, to fasten a chain round the axle-tree of a pair of cart-wheels (the body of which has been taken off); to hook such chain to the ear at the end of the beam; and, by lengthening or shortening the chain, this machine may be so regulated as to penetrate the soil to a greater or less depth, according to the nature of the ground.—When the plough is at work, the fore-coulters cut the outside of the gutter.—The back coulter divides the ground exactly in the middle: the farther shelfe-board throws out half the soil on one side, while the near shelfe-board removes the other half to the opposite side; and thus a complete gutter is left, which extends from eight to ten inches in width, and is from six to eight inches deep.

One of the most important advantages resulting from this invention is the saving in manual labour, which is computed at three-fourths; as 400 perches of land may thus be drained in one day, by a team of five horses, two drivers, and a holder; the expence of which the inventor calculates at 16s.; whereas if the same quantity of land were to be dug by hand, the cost would amount to 31. 6s. 8d.

Mr. Turner's plough may be applied to another valuable branch of agriculture; namely, the planting of potatoes. His method is as follows: First, trenches are made with the machine, at the distance of about two feet from each other; and in which the potatoes are set. Some manure is next spread on them in such trenches, and they are covered by drawing the plough through the intermediate spaces; so that each trench is filled by a ridge of soil. When the growing potatoes require an additional covering of mould, the weeds are previously cut, either by a hoe or weeding-hook; and, the two fore-coulters being taken off the plough, the implement is drawn between the ridges; it throws up an additional portion of soil upon them; and thus expeditiously effects the operation of moulding.

Besides these, now described, several other ploughs have been contrived for particular purposes; these, however, with those enumerated in the article HUSBANDRY, are the chief: and we shall only add to the present article a description (extracted from M. Simonde's *Tableau de l'Agriculture Toscane*, 8vo. Geneva, 1801) of two ploughs that are used in Tuscany, as well as in other parts of Italy; and which, from the simplicity of their construction, deserve to be more generally known in Britain.

The first is denominated the *greater Tuscan plough*: the sock is an iron plate, somewhat concave, which is from eight to nine inches, both in breadth and in length; it is sharpened on every side, so as to divide the soil in an horizontal

direction, and with great ease. The coulter is perpendicular upon the angle of the sock; and a moveable board (*versoir*) is placed flat over the chep, in such a manner as to form a continuation of the sock, and to pass under the clod which the latter has raised: but, as it describes a curve on the side opposite to that of the coulter, it deviates from the line, and is turned upside-down, together with the soil which it has received. The implement, thus constructed, meets with the smallest possible resistance in working the ground; its sock divides the earth with a facility equal to that of a common spade; and, as its motion is continued, it acquires greater power of action than the latter:—the coulter also, being vertical, passes on with less difficulty than such as are always in an inclined position. Lastly, the Italian mould-board being flat, receives the soil from the sock, which it turns over to the side, without increasing the resistance encountered by the implement, in consequence of this secondary operation.

The *lesser Tuscan-plough* is lighter, and more diminutive in all its dimensions, than the preceding. Its sock is of a similar shape, but the coulter is perpendicular beneath its beam, between the course of the sock; and instead of the mould-board (of which this machine is destitute), its broad chep is formed in the shape of a plane (*doloire*) so as to turn the earth equally on both sides. In order to work the plough, the labourer conducts it between each border (*plate-bande*), which he divides at a single stroke, thrusting the soil of either side towards the furrow of the preceding year: and, while the latter is nearly filled up, he forms the trench, which is to continue open during the next season, so that the soil is alternately stirred, according to the system of Mr. Tuil; being sown one year, and serving as a furrow in the subsequent.—Thus the field presents alternately, after ploughing, two ridges adjoining to each other, and then a furrow. Next, the labourer passes a small square harrow over these elevations, which he levels; while the furrow remains untouched, and the soil is thus ultimately prepared for sowing.

The agricultural reader will observe, from the construction of these implements, that they are not calculated for working stiff clays; as the ground cannot be entirely removed, and some part must even remain untouched. But, in the rich friable soils of Tuscany, the smaller plough is a most useful instrument; for, in that country, the least effort is sufficient to divide and pulverize the land: we have been induced to communicate the kind above-mentioned, chiefly on account of its simplicity, and as there are similar soils in the southern parts of Britain; where, we conceive, the Italian ploughs may be advantageously employed.—Lastly, the deep furrows, that remain in the ground after it has been ploughed, present a greater surface to the action of the sun and air; a circumstance materially conducing to its improvement.

We have here given an extensive view of the subject, on account of its national importance.—Justice, however, impels us to mention another contrivance, for ascertaining the force necessary in the draught of various ploughs. It was presented to the public by Mr. More, the late ingenious secretary to the Society for the Encouragement of Arts, &c.: it consists of a spring coiled within a cylindrical case, which is furnished with a dial-plate numbered in a manner similar to that of a clock; and which is so constructed, that the hand

moves in consequence of the motion of the spring, and points to the numbers according to the force exerted: thus, if the draught be equal to one cwt. over a pulley, the hand will be directed towards figure 1; when the draught equals two cwt. it points to figure 2; and continues to increase, or diminish, its progress in proportion to the exertions made.

Various experiments were conducted under the inspection of the society, when the accuracy of this machine was fully evinced; a detailed account of which is inserted in the first volume of *Annals of Agriculture*, where the different results are minutely recorded.

PLOUGH, or PLOW, in navigation, an ancient mathematical instrument made of box or pear-tree, and used to take the height of the sun or stars in order to find the latitude.

It admits of the degrees to be very large, and has been much esteemed by many artists; though now generally disused amongst us.

PLOUGH, among bookbinders, is a machine for cutting smooth the edges of the leaves of books.

To PLOUGH. v. n. To practise aration; to turn up the ground to receive seed (*Isaiah*).

To PLOUGH. v. a. 1. To turn up with the plough (*Dryden*). **2.** To bring to view by the plough (*Woodward*). **3.** To furrow; to divide (*Addison*). **4.** To tear; to hollow (*Shakspeare*).

PLOUGHBOY. s. (*plough and boy*.) A boy that follows the plough; a coarse ignorant boy (*Watts*).

PLOUGHHER. s. (*from plough*.) One who ploughs or cultivates ground (*Spenser*).

PLOUGHING, in rural economy, denotes the stirring and turning over of land with the plough.

This is one of the most essential operations in the culture of the earth, and requires to be performed with the greatest care. Whatever, therefore, may be the design of the farmer, or the destination of the ground, thus moved, it ought never to be ploughed in a wet state; because the soil cannot be improved by such labour. Farther, the plough ought to be carried to a considerable depth into the soil; and, if one turning be not sufficient, it will be advisable to pass another plough over the same furrow, so that the land may be effectually stirred; when, being thus exposed to the air, its fertilizing properties will not only be considerably augmented, but all perennial weeds will be completely eradicated. Deep ploughing, however, is unnecessary for land that has been recently manured with lime or marl; but, on exhausted soils, it is uncommonly beneficial, and has, therefore, been generally recommended by the most skilful husbandmen.

Ploughing increases the food of plants; as it opens the soil for the reception of vegetable aliment from the air and light; and, the surface being consequently enlarged, a greater portion of land is thus exposed to its influence. Farther, by breaking up the ground, if it be too solid, and rendering it firm, in case it be too light, this operation greatly tends to improve the earth; and, as weeds and other

vegetable substances are thus reduced to a state of putrefaction, it promotes the nourishment of the new roots. Lastly, ploughing removes too great humidity, by forming the land into small ridges, and contributes to the eradication of weeds, as it first causes their seeds to vegetate, and afterwards tearing up the young plants, exposes their roots to the drought, in consequence of which they are deprived of their vegetative power. For the rest, see **PLOUGH** and **HUSBANDRY**.

PLOUGHLAND. *s.* (*plough and land*.)
A farm for corn (*Donne*).

PLOUGHMAN. *s.* (*plough and man*.)
1. One that attends or uses the plough; a cultivator of corn (*Taylor*). 2. A gross ignorant rustic (*Shakspeare*). 3. A strong laborious man (*Arbutnot*).

PLOUGHMAN'S OF PLOWMAN'S SPIKE-NARD. See **BACCHARIS** and **CONYZA**.

PLOUGHMONDAY. *s.* The Monday after Twelfth-day (*Tusser*).

PLOUGHSHARE. *s.* (*plough and share*.)
The part of the plough that is perpendicular to the coulter (*Sidney*).

PLOWDEN (Edmund), serjeant at law, was the son of Humphrey Plowden of Plowden in Shropshire, of an ancient and genteel family. He was first a student in the university of Cambridge, where he spent three years in the study of philosophy and medicine. He then removed to Oxford, where, having continued his former studies about four years more, in 1552 he was admitted to the practice of physic and surgery: but probably finding the practice of the art of healing less agreeable than the study, he entered himself of the Middle Temple, and began to read law. Wood says, that in 1557 he was summer reader to that society, and Lent-reader three years after, being then serjeant and oracle of the law. He died in the year 1584, aged 67; and was buried in the Temple-church near the north wall, at the east end of the choir. He married the daughter of William Sheldon of Boley, in Worcestershire; by whom he had a son, who died soon after his father. He wrote, 1. Commentaries or Reports of divers Cases, &c. in the Reigns of King Edward VI. Queen Mary, and Queen Elizabeth; London, 1571, 78, 99, 1613, &c. Written in the old Norman language. 2. Queries, or a Moot-book of Cases, &c. translated, methodized, and enlarged, by H. B. of Lincoln's Inn; Lond. 1662. 8vo.

PLUCHE (Antony), born at Rheims in 1688, merited by his engaging manners and proficiency in the belles-lettres the appointment of humanist in the university of that city. Two years after he obtained the professor of rhetoric's chair, and was admitted into holy orders. The bishop of Laon, (Clermont) informed of his talents, offered him the direction of the college of his episcopal city. By his industry and superior knowledge, a proper order and subordination soon took place in it; but some particular opinions respecting the affairs of the time disturbed his tranquillity, and obliged him to quit his office. The intendant

of Rouen, at the request of the celebrated Rollin, entrusted him with the education of his son. Abbé Pluche, having filled that place with success and great honour to himself, left Rouen and went to Paris, where, by the patronage of some literary friends and his own excellent writings, he acquired a very distinguished reputation for learning. He published, 1. *Le Spectacle de la Nature* (Nature Displayed), in 9 vols. in 12mo. This work, which is equally instructive and entertaining, is written with perspicuity and elegance; but the form of dialogue which the author adopted has drawn him into the fault of being too prolix. The speakers, who are the prior, the count, and countess, are not distinguished by any striking feature; but they have all the common character, which is tolerably pleasing, not excepting even that of the little chevalier De Breuil, who is, however, a mere scholar. This is the opinion which Abbé Desfontaines has formed of this work. Though the author has given the conversations a pretty ingenious turn, and even some vivacity, yet they now and then fall into the tone of the college. 2. *Histoire du Ciel, or History of the Heavens*, in 2 vols. in 12mo. In this performance we find two parts almost independent of one another. The first contains some learned inquiries into the origin of the poetic heavens. It is nearly a complete mythology, founded upon ideas which are new and ingenious. The second is the history of the opinions given by philosophers respecting the formation of the world. The author shows the inutility, inconstancy, and uncertainty, of the most esteemed systems; and concludes with pointing out the excellence and sublime simplicity of the Mosaic account. Besides a noble and well-turned expression, we find in it an erudition which does not fatigue the mind. As to the foundation of the system explained in the first part, though it appears plausible, we will not take upon us to say how far it is true: Voltaire called it *Fable du Ciel*, or a *Fable of the Heavens*. 3. *De Linguarum artificio*; a work which he translated with this title, *La Mécanique des Langues*, in 12mo. In this treatise he proposes a short and easy method of learning languages, which is by the use of translations instead of themes or exercises; and we must admit his reflections on that subject are both judicious and well expressed. 4. *Harmony of the Psalms and the Gospel, or a Translation of the Psalms and Hymns of the Church*, with Notes relative to the Vulgate, the Septuagint, and Hebrew Text, printed at Paris in 1764, in 12mo. In 1749, Abbé Pluche retired to Varenne St. Maure, where he gave himself up entirely to devotion and study. Having become so deaf that he could not hear without the help of a trumpet, the capital afforded him very little entertainment. It was in this retreat that he died of an apoplexy on the 20th of November 1761, at the age of 73 years. He possessed those qualities which form the scholar, the honest man, and the christian: temperate in his meals, true to his word, an affectionate

parent, a sensible friend, and a humane philosopher; he gave lessons of virtue in his life as well as in his writings. His submission to all the truths of religion was very unreserved. Some deists having been surprised that, in matters of faith, he should think and speak like the vulgar, his answer was, "I glory in doing so: it is infinitely more rational to believe the word of God, than to follow the glimmering lights of a reason which is limited and subject to error."

To PLUCK. *v. a.* (plocian, Saxon.) 1. To pull with nimbleness or force; to snatch; to pull; to draw; to force on or off; to force up or down (*Gay*). 2. To strip of feathers (*Sh.*). 3. To pluck up a heart or spirit. A proverbial expression for taking up or resuming of courage (*Knolles*).

PLUCK. *s.* (from the verb.) 1. A pull; a draw; a single act of plucking (*L'Estrange*). 2. The heart, liver, and lights of an animal.

PLUCKER. *s.* (from pluck.) One that plucks (*Shakespeare*).

PLUG. *s.* (*plugg*, Swedish; *plugghe*, Dut.) A stopple; any thing driven hard into another body to stop a hole (*Boyle*).

To PLUG. *v. n.* To stop with a plug (*Sharp*).

PLUKENETIA, in botany, a genus of the class monœcia, order monadelphica. Calyxless; corol four-petalled. Male: stamens eight; nectaries four, bearded. Fem.: style very long; stigma peltate, four-lobed; capsule four-grained. One species; a native of the Indies, with twining stem; heart-shaped, serrate, acute leaves; racemes of numerous male flowers and a few females at bottom.

PLUM. *s.* (plum, *plumtreop*, Saxon.) 1. A fruit with a stone (*Locke*). 2. Raisin; grape dried in the sun (*Shakespeare*). 3. (In the cant of the city.) The sum of one hundred thousand pounds (*Addison*). 4. A kind of play, called How many plums for a penny (*Ainsworth*).

PLUM, in botany. See PRUNUS.

PLUM (American black), in botany. See CHRYSOBALANUS.

PLUM (Bay), in botany. See PSIDIUM.

PLUM (Brazilian), in botany. See SPONDIAS.

PLUM (Indian date), in botany. See DIOSPYROS.

PLUM (Pishamin or Persimon), in botany. See DIOSPYROS.

PLUMAGE. *s.* (*plumage*, Fr.) Feathers; suit of feathers (*Bacon*).

PLUMB. *ad.* (from the noun.) Perpendicularly to the horizon (*Ray*).

To PLUMB. *v. a.* (from the noun.) 1. To sound; to search by a line with a weight at its end (*Swift*). 2. To regulate any work by the plummet.

PLUMB-LINE, among artificers, denotes a line perpendicular to the horizon: so called because it is commonly erected by means of a plummet.

PLUMBAGO. Leadwort. In botany, a genus of the class pentandria, order monogynia. Corol funnel-formed; stamens inserted into

scales closing the base of the corol; stigma five-cleft; seed one, oblong, coated. Seven species: south of Europe, Cape, India, America. The following are cultivated.

1. *P. Europæa*. European leadwort. Stiff, slender, channelled stem; leaves clasping the stem, lanceolate, rough; corol lead-colour. The leaves are used as a cure for the tooth-ach; whence it was formerly called in the dispensatories dentaria, or dentillaria. A native of the South of Europe.

2. *P. Zeylanica*. Ceylon leadwort. Leaves petioled, ovate, glabrous; upper part of the stalks and calyx of the flowers very glutinous, and sticky; entangling small flies that settle on them. India.

3. *P. rosea*. Rose leadwort. Leaves petioled, ovate, glabrous, slightly denticulate; stem with gibbous joints. A shrubby Indian plant.

4. *P. scandens*. Climbing leadwort. Leaves petioled, ovate, glabrous; stem flexuous, climbing; flowers terminal.

The first sort is increased by parting the roots; the other three should be raised from seeds sown in pots in the spring, and plunged into a hot-bed.

PLUMBAGO, carburet of iron. This mineral is found in various parts of Europe and America. It occurs in kidney-form lumps of various sizes. Its colour is dark iron-grey, or brownish-black; when cut, blueish-grey. Opaque and slaty; texture fine-grained; brittle; specific gravity from 1.98 to 2.09; feels somewhat greasy; stains the fingers, and marks strongly. The use of this mineral, when manufactured into pencils, is known to every person. It consists of

90 of carbon
10 of iron

100. See GRAPHITES.

PLUMBER. *s.* (*plombier*, Fr.) One who works upon lead.

PLUMBERY, the art of casting and working lead, and using it in building. As this metal melts soon and with little heat, it is easy to cast it into figures of any kind, by running it into moulds of brass, clay, plaster, &c. But the chief article in plumbery is sheets and pipes of lead; and as these make the basis of the plumber's work, we shall here give the process of making them.

In casting sheet-lead, a table or mould is made use of, which consists of large pieces of wood well jointed, and bound with bars of iron at the ends, on the sides of which runs a frame, consisting of a ledge, or border of wood, two or three inches thick, and two or three inches high from the mould, called the sharps: the ordinary width of the mould, within these sharps, is from three to four feet; and its length is sixteen, seventeen, or eighteen feet. This should be something longer than the sheets are intended to be, in order that the end where the metal runs off from the mould may be cut off, because it is commonly thin, or uneven, or ragged at the end. It must stand very even or level in breadth, and something

PLUMBERY.

falling from the end in which the metal is poured in, viz. about an inch, or an inch and a half, in the length of sixteen or seventeen inches. At the upper end of the mould stands the pan, which is a concave triangular prism, composed of two planks nailed together at right angles, and two triangular pieces fitted in between them at the ends. The length of this pan is the whole breadth of the mould in which the sheets are cast; it stands with its bottom, which is a sharp edge, on a form at the end of the mould, leaning with one side against it, and on the opposite side is a handle to lift it up by, to pour out the melted lead; and on that side of the pan next the mould are two iron hooks to take hold of the mould, and prevent the pan from slipping, while the melted lead is pouring out of it into the mould. This pan is lined on the inside with moistened sand, to prevent it from being fired by the hot metal. The mould is also spread over, about two-thirds of an inch thick, with sand sifted and moistened, which is rendered perfectly level by moving over it a piece of wood called a strike, by trampling upon it with the feet, and smoothing it over with a smoothing plane, which is a thick plate of polished brass, about nine inches square, turned up on all the four edges, and with a handle fitted on the upper or concave side. The sand being thus smoothed, it is fit for casting sheets of lead; but if they would cast a cistern, they measure out the bigness of the four sides, and having taken the dimensions of the front, or fore-part, make mouldings by pressing long slips of wood, which contain the same mouldings, into the level sand, and form the figures of birds, beasts, &c. by pressing in the same manner leaden figures upon it, and then taking them off, and at the same time smoothing the surface where any of the sand is raised up, by making these impressions upon it.

The rest of the operation is the same in casting either cisterns or plain sheets of lead; but before we proceed to mention the manner in which that is performed, it will be necessary to give a more particular description of the strike. The strike, then, is a piece of board about five inches broad, and something longer than the breadth of the mould on the inside; and at each end is cut a notch about two inches deep, so that when it is used, it rides upon the sharps with those notches. Before they begin to cast, the strike is made ready by tacking on two pieces of an old hat on the notches, or by slipping a case of leather over each end, in order to raise the under side about one eighth of an inch, or something more, above the sand, according as they would have the sheet to be in thickness; then they tallow the under edge of the strike, and lay it across the mould. The lead being melted, it is ladled into the pan, in which, when there is a sufficient quantity for the present purpose, the scum of the metal is swept off with a piece of board to the edge of the pan, letting it settle on the sand, which is by this means prevented from falling into the mould at the pouring out of the metal. When

the lead is cool enough, which is known by its beginning to stand with a shell or wall on the sand round the pan, two men take the pan by the handle, or else one of them lifts it up by a bar and chain fixed to a beam in the ceiling, and pour it into the mould, while another man stands ready with the strike, and, as soon as they have done pouring in the metal, puts on the mould, sweeps the lead forward, and draws the overplus into a trough prepared to receive it. The sheets being thus cast, nothing remains but to planish the edges, in order to render them smooth and straight; but if it be a cistern, it is bent into four sides, so that the two ends may join the back, where they are soldered together, after which the bottom is soldered up.

The method of casting thin sheets of lead.—Instead of sand, they cover the mould with a piece of woollen stuff nailed down at the two ends to keep it tight, and over this lay a very fine linen cloth. In this process great regard is had to the just degree of heat, so as that the lead may run well, and yet not burn the linen. This they judge of by a piece of paper, for it takes fire in the liquid lead if it is too hot, and if it be not shrunk and scorched a little, it is not hot enough.

The method of casting pipes without soldering.—To make these pipes they have a kind of little mill, with arms or levers to turn it withal. The moulds are of brass, and consist of two pieces, which open and shut by means of hooks and hinges, their inward calibre, or diameter, being according to the size of the pipe to be made, and their length is usually two feet and a half. In the middle is placed a core, or round piece of brass or iron, somewhat longer than the mould, and of the thickness of the inward diameter of the pipe. This core is passed through two copper rundles, one at each end of the mould, which they serve to close; and to these is joined a little copper tube, about two inches long, and of the thickness the leaden pipe is intended to be of. By means of these tubes the core is retained in the middle of the cavity of the mould. The core being in the mould, with the rundles at its two ends, and the lead melted in the furnace, they take it up in a ladle, and pour it into the mould by a little aperture at one end, made in the form of a funnel. When the mould is full, they pass a hook into the end of the core, and, turning the mill, draw it out; and then, opening the mould, take out the pipe. If they desire to have the pipe lengthened, they put one end of it in the lower end of the mould, and pass the end of the core into it; then shut the mould again, and apply its rundle and tube as before, the pipe just cast serving for rundle, &c. at the other end. Things being thus replaced, they pour in fresh metal, and repeat the operation till they have got a pipe of the length required. For making pipes of sheet-lead, the plumbers have wooden cylinders, of the length and thickness required, and on these they form their pipes by wrapping the sheet around them, and soldering up the edges all along them.

PLUMBUM.

PLUMBUM. Lead. In mineralogy, a genus of the class metals. Blueish-white, gradually blackening in the air, soft, very malleable, a little ductile and tenacious, not sonorous, staining the fingers of a blueish colour, specific gravity 11,352, easily melting, exhibiting iridescent colours on the surface during liquefaction, and becoming first a white, then a grey, then a yellow, and lastly a red oxyd, all of which are easily convertible into glass; soluble in all acids, and giving the solution a sweetish taste, precipitating a yellow powder if dissolved in nitric acid, and potash be added to the solution. Twenty-three species.

1. *P. nativum.* Native, or naked lead. Found in Monmouthshire, Poland, and Silesia; though it is much doubted whether lead be ever found in a perfectly metallic state.

2. *P. ochraceum.* Earthy lead-ore: earthy lead ochre: white opake lead-ore. Pulverulent, without lustre, totally soluble in nitric acid with effervescence, easily reducible to a metallic state on charcoal. Found in various lead mines of Great Britain, Saxony, Germany, &c. in a loose earthy state, and generally seated on galena: colour white, grey, red, or yellow; becomes red when exposed to a sufficient heat, and contains a considerable portion of carbonic acid gas: yields from 60 to 80 per cent. of lead.

3. *P. terreum.* Earthy lead-ore; white opake lead-ore; earthy indurated lead-ore. Indurated, without lustre, earthy internally, soluble in nitric acid with effervescence. Found with the last, of which it is perhaps only an indurated variety, in larger or less masses intermixed with masses of other ores and fossils, in various shades of white, grey, blue, yellow, red or brown.

4. *P. micaceum.* Greasy to the touch, lamellar, of a silvery colour and lustre. Found in the mines of the Hartz, and consists of numerous plates incumbent on each other.

5. *P. vitreum.* Glass of lead. Semitransparent, brittle, of a glassy texture and lustre and common form. Found in Somersetshire, and the lead-hills in Scotland, in France, Saxony, Siberia, Hungary, &c.; colour white, grey, or yellowish-green; texture conchoidal or splintery; it does not effervesce with nitric acid.

6. *P. spatiosum.* Carbonat of lead: white lead-ore: white carbonat of lead. Shining externally and internally, soft, white, decrepitating in the fire, effervescing with acids generally in the form of crystals. Found in various parts of Great Britain and Ireland, in Burgundy, Austria, Saxony, Hungary, rarely in a globular or cellular form, or disseminated, but most commonly crystallized in rectangular eight-sided prisms with obtuse pyramids variously truncated, or in tables or various forms; colour silvery or pale white, with sometimes a silky lustre, or tinged with brown, greenish, or yellowish; texture lamellar or conchoidal, of the crystals often fibrous; soft enough to be cut with a knife, and soluble in fat oils; when heated decrepitates, then turns yellow, and

afterwards red; before the blowpipe is quickly reduced, and blackens with sulphurated volatile alkali; specific gravity from 6,250 to 6,920: contains

Oxyd of lead	-	-	-	84
Carbonic acid	-	-	-	16

100 *Klaproth.*

7. *P. hyalinum.* Murio-carbonat of lead. Transparent, effervescing with nitric acid, soft, decrepitating on red hot coals, of a glassy lustre, in the form of crystals. Found in the mines of Derbyshire and of the Hartz, in crystals; colour from a clear transparent white to a pale straw-yellow, with a lustre much exceeding that of the last; texture glassy, resembling that of precious stones; soft enough to be scratched by carbonat of lead; specific gravity 6,065: consists of

Oxyd of lead	-	-	-	85
Carbonic acid	-	-	-	6
Muriatic acid	-	-	-	8
Loss	-	-	-	1

100

8. *P. flavum.* Yellow lead-ore: molybdat of lead: yellow molybdenated lead-ore. Yellow, in the form of crystals, soft, decrepitating before the blowpipe, soluble in muriatic and sulphuric acids, and giving a blue colour to hot sulphuric acid. Found at the lead-hills in Scotland, in Carinthia, Britany, Burgundy, the Hartz, Austria, &c. seldom massive, disseminated, or lamellar, but most commonly crystallized; colour various shades of yellow with a waxy lustre and generally somewhat transparent, with a white streak; fracture conchoidal; before the blowpipe it decrepitates and melts into a yellowish and blackish-grey mass, producing globules of lead: specific gravity 5,486.

9. *P. virens.* Phosphat of lead: phosphorated lead-ore. Greenish, ponderous, breaking into indeterminate fragments and reducible to a yellow powder, nearly soluble in hot nitric acid without effervescence, melting before the blowpipe, and crystallizing on cooling. Found in the lead-mines of Great Britain, New Spain, Siberia, Bohemia, Germany, Carinthia, massive, disseminated, imitative, in six-sided columns variously modified; colour various shades of green, with often a mixture of yellowish or greyish, or yellowish-brown, shining, transparent, with a greenish-white streak and yellowish powder; before the blowpipe it melts easily, and crystallizes on cooling; texture foliated, fracture inclining to conchoidal: specific gravity from 6,270 to 6,560.

10. *P. jaspideum.* Brown, hard, opake, of a common form. Found near Saska on the Carpathic mountains, and contains 36 per cent. of lead and a little silver and gold.

11. *P. fuliginosum.* Black, without lustre, soiling the fingers, not totally soluble in nitric acid, emitting sulphurous flames and vapours before the blowpipe, and crystallizing on cooling. Found at Freyburg, and in Britany; and besides oxyd of lead and phosphoric acid,

contains some sulphur; perhaps only a sulphurat of lead in a decomposing state.

12. *P. alvernium*. Arsenico-phosphat of lead; arsenicated phosphat of lead. Greenish-yellow, without lustre, bubbling and emitting arsenical fumes before the blowpipe, and crystallizing on cooling. Found at Auvergne in France, in masses, or crystallized in small six-sided prisms; colour yellowish-green, of various shades; fracture fibrous, striated, or conchoidal; before the blowpipe melts easily with effervescence, emitting a white smoke and arsenical smell: specific gravity 6,846.

13. *P. arsenicatum*. Arseniat of lead; arsenicated lead-ore. Without lustre, melting before the blowpipe, but not crystallizing on cooling; emitting arsenical fumes when heated to whiteness, and leaving a bead of lead. Found in the mines of Burgundy and Andalusia, in quartz or feldspar, and in small masses; colour pale-green or yellowish-green with a waxy lustre; when thrown on hot coals it easily becomes white.

14. *P. duplex*. Without lustre; before the blowpipe emitting arsenical and sulphuric flames and vapours. Found at Auvergne in France, and consists of oxyd of lead combined with the arsenical and sulphuric acids.

15. *P. vitriolatum*. Sulphat of lead; vitriol of lead; vitriolated lead. Whitish, without lustre, quite fixed, easily melting before the blowpipe without decrepitation or effervescence, not effervescing with acids. Found in the lead-mines of Strontian in Scotland, in Anglesea and Andalusia, sometimes variously modified, but generally in very minute crystals, but mostly above the beds of galena, from the decomposition of which it seems to originate; colour white or grey, more or less pellucid; fracture compact; partly soluble in water, and soon reduced before the blowpipe; specific gravity 6,300.

16. *P. corneum*. White, without metallic lustre, easily melting before the blowpipe, and in a greater heat entirely evaporating. Found in the mines of Lotharingia and Bohemia.

17. *P. plumbago*. Compact galena. With metallic lustre, easily melting with sulphurous vapour and flame, and leaving a bead of lead without any mixture of silver. Found in the lead-mines of England and Scotland, and Norway, Sweden, Spain, Saxony, &c. in masses, nodular or specular; colour lead-grey with a bright streak; texture compact, generally breaking into indeterminate fragments: specific gravity 7,444; contains merely lead combined with sulphur.

18. *P. galena*. Galena; lead-glance; sulphur of lead; sulphuret of lead. Of the colour and lustre of lead, ponderous, soft, presenting granular concretions, breaking into cubical fragments, melting with a sulphurous flame and vapours, and when the lead is reduced to a glassy oxyd, leaving a bead of silver.

Another species of an indigo-blue and lead-grey, compact, foliated, or fibrous, sometimes

striate longitudinally, known by the name of blue lead-ore.

Found in various parts of Great Britain and the continent, particularly Siberia, massive, in nodules, investing or specular, and often coated with gold or silver mica; texture foliated with cubical fragments; brittle; sometimes soft enough to be cut with a knife, and often stains the fingers; before the blowpipe decrepitates, melts easily with a sulphurous smell, and if alternately heated and cooled will at last vanish, leaving its silver behind; it is composed of various modifications of lead, sulphur, and silver: specific gravity from 7,220 to 7,587.

19. *P. feriferum*. Brown lead-ore; basaltic lead; striated galena. With metallic lustre, melting with sulphurous vapours and flame, but more difficultly than galena, and if the heat be increased forming a black glass. Found in the mines of Sweden, sometimes massive, sometimes crystallized in clusters, containing besides lead and sulphur, some silver and iron.

20. *P. stibiatum*. Antimonial lead-ore. Of the colour and lustre of lead, fibrous, breaking into crustose fragments. Found in the mines of Siberia, Sweden, Hungary, and Spain, of a compact and striated texture, with the pieces into which it breaks either straight or incurved, and the fibres parallel or fascicled; when heated it emits sulphurous flame and vapours; besides lead and sulphur, it contains antimony and silver.

21. *P. hereynicum*. Weisgolden. Klaproth. Combined with copper and antimony, a smaller proportion of iron and sulphur, and a very small quantity of silver, with metallic lustre. Found in the mines of Andreasburg in the Harz; contains

Lead	-	-	-	34,0
Copper	-	-	-	16,3
Antimony	-	-	-	16,0
Iron	-	-	-	13,7
Sulphur	-	-	-	10,0
Silver	-	-	-	2,3
Loss	-	-	-	7,7

100 Klaproth.

22. *P. cornubicum*. Combined with antimony and a smaller proportion of copper and sulphur, and a very small quantity of iron, with metallic lustre. Found in the mines of Cornwall, and contains

Oxyd of lead	-	-	-	50
Antimony	-	-	-	21
Copper	-	-	-	14
Sulphur	-	-	-	7
Iron	-	-	-	2
Loss	-	-	-	6

100 Klaproth.

23. *P. subaudiicum*. With metallic lustre, emitting arsenical vapours before the blowpipe. Found in the mines of Subandia, and consists of oxyd of lead, antimony and arsenic.

PLUMCAKE. *s.* (*plum* and *cake*) Cake made with raisins (*Hudibras*).

PLUME. *s.* (*plume*, French; *pluma*, Lat.)

H H

1. Feather of birds (*Milton*). 2. Feather worn as an ornament (*Dryden*). 3. Pride; towering mien (*Shakspeare*). 4. Token of honour; prize of contest (*Milton*). 5. That part of the seed of a plant, which in its growth becomes the trunk (*Quincy*).

TO PLUME. *v. a.* (from the noun.) 1. To pick and adjust feathers (*Mort.*). 2. (*plumer*, Fr.) To strip off feathers (*Ray*). 3. To strip; to pill (*Bacon*). 4. To place as a plume (*Milton*). 5. To adorn with plumes (*Shakspeare*). 6. To make proud: 'as, he plumes himself.

PLUMERIA, in botany, a genus of the class pentandria, order monogynia. Corol twisted; follicles two, reflected; seeds two, inserted into their proper membrane. Four species, natives of the West Indies or America.

1. *P. rubra*. Red plumeria, or jasmine. A milky succulent shrub, with clustered, terminal flowers of a pale red colour.

2. *P. alba*. Whiteplumeria. Flowers white, in spikes with a yellowish eye, and considerable fragrance.

3. *P. obtusa*. Blunt-leaved plumeria. Flowers like the last on branched peduncles.

4. *P. pudica*. Close-flowered plumeria. Flowers numerous, yellowish, rolled up like those of hibiscus; odour exquisite.

All are cultivated, and may be increased by seeds or cuttings; but require, excepting in the warmer months, the aid of a greenhouse.

PLUM'GEROUS. *a.* (*pluma* and *gero*, Lat.) Having feathers; feathered.

PLUM'PEDE. *s.* (*pluma* and *pes*, Latin.) A fowl that has feathers on the foot.

PLUMMET, **PLUMB-RULE**, or **PLUMB-LINE**, an instrument used by carpenters, masons, &c. in order to judge whether walls, &c. be upright planes, horizontal, or the like. It is thus called from a piece of lead, *plumbum*, fastened to the end of a cord, which usually constitutes this instrument. Sometimes the string descends along a wooden ruler, &c. raised perpendicularly on another; in which case it becomes a level. See **LEVEL**.

PLUMMING, among miners, is the method of using a mine-dial, in order to know the exact place of the work where to sink down an air-shaft, or to bring an adit to the work, or to know which way the load inclines when any flexure happens in it. It is performed in this manner: a skilful person, with an assistant, and with pen, ink, and paper, and a long line, and a sun-dial, after his guess of the place above ground, descends into the adit or work, and there fastens one end of the line to some fixed thing in it, then the incited needle is let to rest, and the exact point where it rests is marked with a pen: he then goes on further in the line still fastened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwise; and then letting down the dial again, he there likewise notes down that point at which the needle stands in this second position. In this manner he proceeds from turning to turning, marked down the points, and marking the line, till he

comes to the intended place; this done, he ascends and begins to work on the surface of the earth what he did in the adit, bringing the first knot in the line to such a place where the mark of the place of the needle will again answer its pointing, and continues this till he comes to the desired place above ground, which is certain to be perpendicularly over the part of the mine into which the air-shaft is to be sunk.

PLUMOSE or **PLUMOUS BRISTLE.** In botany. A feathered bristle. *Villosa composita*. Having hairs growing on the sides of the main bristle. Resembling a feather.

PLUMOSE PAPPUS. Feathered or compound down. *Pilis pennatis constans*—*s. villosus compositus*. A flying crown to some seeds, composed of compound or feathery hairs: as in *crepis*, *scorzonera*, *tragopogon*. Opposed to capillary. See **PAPPUS**.

PLUMOSITY. *s.* (from *plumous*.) The state of having feathers.

PLUMOUS. *a.* (*plumeux*, Fr. *plumosus*, Lat.) Feathery; resembling feathers (*Woodward*).

PLUMP. *a.* (perhaps from *plum*, when full and ripe.) Somewhat fat; not lean; sleek; full and smooth (*L'Estrange*).

PLUMP. *s.* (from the adjective.) A knot; a tuft; a cluster; a number joined in one mass. Now corrupted to *clump* (*Sandys*).

TO PLUMP. *v. a.* (from the adjective.) To fatten; to swell; to make large (*Boyle*).

TO PLUMP. *v. n.* (from the adverb.) 1. To fall like a stone in the water. 2. (from the adjective.) To be swollen.

PLUMP. *ad.* (probably corrupted from *plumb*, or perhaps from the sound of a stone falling on the water.) With a sudden fall (*Ben Jonson*).

PLUM'PER. *s.* Something worn in the mouth to swell out the cheeks (*Swift*).

PLUM'PNES. *s.* Fulness; disposition toward fatness (*Newton*).

PLUM'PORRIDGE. *s.* (*plum* and *porridge*.) Porridge with plums (*Addison*).

PLUM'PUDDING. *s.* (*plum* and *pudding*.) Pudding made with plums.

PLUM'PY. *a.* Plump; fat (*Shakspeare*).

PLUMULE. The plume, or ascending scaly part of the coraculum or heartlet of the seed.

PLUM'Y. *a.* (from *plume*.) Feathered; covered with feathers (*Milton*).

TO PLUN'DER. *v. a.* (*plunderin*, Dutch.) 1. To pillage; to rob in an hostile way (*South*).

2. To take by pillage (*Dryden*). 3. To rob as a thief (*Pope*).

PLUN'DER. *s.* (from the verb.) Pillage; spoils gotten in war (*Otway*).

PLUN'DERER. *s.* (from *plunder*.) 1. Hostile pillager; spoiler. 2. A thief; a robber.

TO PLUNGE. *v. a.* (*plonger*, Fr.) 1. To put suddenly under water, or under any thing supposed liquid (*Dryden*). 2. To put into any state suddenly (*Dryden*). 3. To hurry into any distress (*Watts*). 4. To force in suddenly.

To PLUNGE. v. n. 1. To sink suddenly into water; to dive (*Shakspeare*). 2. To fall or rush into any hazard or distress (*Tillotson*).

PLUNGE. s. 1. Act of putting or sinking under water. 2. Difficulty; strait; distress (*Baker*).

PLUNGEON. s. (*mergus*, Lat.) A sea bird (*Ainsworth*).

PLUNGER. s. (from *plunge*.) One that plunges; a diver.

PLUNGER, in mechanics, a solid brass cylinder, used as a forcer in forcing pumps.

PLU'NKET. s. A kind of blue colour (*Ainsworth*).

PLU'RAL. a. (*pluralis*, Latin.) Implying more than one (*Shakspeare*).

PLURALIST. s. (*pluraliste*, French.) One that holds more ecclesiastical benefices than one, with cure of souls (*Collier*).

PLURA'LITY. s. (*pluralité*, French.) 1. The state of being or having a greater number (*Bacon*). 2. A number more than one (*Hammond*). 3. More cures of souls than one. 4. The greater number; the majority (*L'Es-trange*).

PLURALLY. ad. (from *plural*.) In a sense implying more than one.

PLUS, in algebra, the affirmative or positive sign, +, signifying more or addition, or that the quantity following it is either to be considered as a positive or affirmative quantity, or that it is to be added to the other quantities; so $4 + 6 = 10$, is read thus, 4 plus 6 is equal to 10. See **AFFIRMATIVE SIGN**.

The more early writers of algebra, as Lucas de Burgo, Cardan, Tartaglia, &c. wrote the word mostly at full length. Afterwards the word was contracted or abbreviated, using one or two of its first letters; which initial was, by the Germans we think, corrupted to the present character +; which was first used by Stifelius, printed in his *Arithmetic*.

PLUSH, in commerce, &c. a kind of stuff leaving a sort of velvet knap, or shag, on one side, composed regularly of a woof of a single woollen thread, and a double warp, the one wool, of two threads twisted, the other goats or camel's hair; though there are some plushes entirely of worsted, and others composed wholly of hair.

Plush is manufactured, like velvet, on a loom with three treadles; two of these separate and depress the woollen warp, and the third raises the hair warp, upon which the workman throwing the shuttle passes the woof between the woollen and hair warp; and afterwards laying a brass broach, or needle, under that of the hair, he cuts it with a knife destined for that use; conducting the knife on the broach, which is made a little hollow all its length, and thus gives the surface of the plush an appearance of velvet. See **VELVET**.

There are other kinds of plush, all of silk; some of which have a pretty long knap on one side, and some on both.

PLUTARCH, a native of Chæronea, descended of a respectable family. Under Ammonius, a reputable teacher at Delphi, Plutarch

was made acquainted with philosophy and mathematics. He afterwards travelled in quest of knowledge, and after he had visited the territories of Egypt and Greece, he retired to Rome, where he opened a school, which was much frequented. The emperor Trajan admired his abilities, honoured him with the office of consul, and appointed him governor of Illyricum. After the death of his imperial benefactor, Plutarch removed to Chæronea. In this peaceful and solitary retreat, Plutarch closely applied himself to study, and wrote the greatest part of his works, and particularly his *Lives*. He died in an advanced old age at Chæronea, about the 140th year of the Christian era. In his private and public character he was the friend of discipline, and boldly asserted the natural right of mankind, liberty.

Plutarch's works admit of a nearly equal division, into *Lives* and *Morals*; the former of which, in his own estimation, were to be preferred as more noble than the latter. His style has been excepted to with some reason: he has also been criticised for some mistakes in Roman antiquities, and for a little partiality to the Greeks. On the other hand, he has been justly praised for the copiousness of his fine sense and learning, for his integrity, and for a certain air of goodness which appears in all he wrote. His business was not to please the ear, but to instruct and charm the mind; and in this none ever went beyond him. Of his moral writings it is to be regretted that we have no elegant English translation. Even his *Lives* were chiefly known to the English reader by a motley and miserable version, till a new one, executed with fidelity and spirit, was presented to the public by the Langhorns in 1770; and this has been recently much improved by Mr. Wrangham. On the whole, it is to be wished that this most amiable moralist and biographer had added a life of himself to those which he has given to the world of others, as the particulars which other writers have preserved of his personal history are very doubtful and imperfect.

Of the Works of Plutarch, the best editions with which we are acquainted are that of H. Stephens, in 13 vols. 8vo. published in 1572, and the elaborate edition of Reiske, in 12 vols. 8vo. published at Leipsic in 1774. Of the *Lives*, the best edition is that of Bryan, published at London in 1729, 5 vols. 4to: of the *Morals*, we have the highly celebrated edition of Wyttenbach, published at Oxford in 1795, both in 4to. and 8vo: the 4to. copies are greatly to be preferred.

PLUTO, in pagan worship, son of Saturn and Ops, inherited his father's kingdom with his brothers Jupiter and Neptune. He received as his lot the kingdom of hell, and whatever lies under the earth, and therefore he became the god of the infernal regions. From his functions, and the place he inhabited, he received different names. He was called Dis, Hades, or Ades, Orcus, &c. As his residence was gloomy, all the goddesses refused to marry him; but upon seeing Proserpine, the daugh-

ter of Ceres, gathering flowers in the plains of Enna, in Sicily, he became enamoured of her, and immediately carried her away. Proserpine called upon her attendants for help, but in vain; and she became the wife of her ravisher, and the queen of hell. Pluto is looked upon as a hard-hearted and inexorable god, with a grim and dismal countenance, and for that reason no temples were raised to his honour, as to the rest of the superior gods. Black victims, and particularly a bull, were the only sacrifices offered to him. Among plants, the cypress, the narcissus, and the maiden-hair, were sacred to him, as also the number two. The dog Cerberus watched at his feet, the harpies hovered around him, and Proserpine sat on his left hand. The Paræ occupied the right. Pluto is called by some the father of the Euménides.

PLUTUS, in pagan worship, son of Jasion or Jasius, by Ceres, the goddess of corn, was the god of riches. He was brought up by the goddess of peace, and on that account, Pax was represented at Athens as holding the god of wealth in her lap. He was represented as blind, because he distributed riches indiscriminately; he was lame, because he came slow and gradually; and he had wings, to intimate that he flew away with more velocity than he approached mankind.

PLUVIAL. **PLUVIOUS**, *a.* (from *pluvia*, Latin.) Rainy; relating to rain (*Brown*).

PLUVIAL. *s.* (*pluvial*, French.) A priest's cope (*Ainsworth*).

PLUVIALES. See **CHARADRIUS**.

PLUVIAMETER. (from *pluvia*, rain; *metior*, to measure.) A machine or apparatus by which the quantity of rain that falls in any given place is measured. This is sometimes called ambrometer, and at others rain-gauge.

The pluviometer employed at the house of the Royal Society is described by Mr. Cavendish in the Philosophical Transactions for 1776. The vessel which receives the rain is a conical funnel, strengthened at the top by a brass ring, 12 inches in diameter. The sides of the funnel and inner lip of the brass ring are inclined to the horizon, in an angle of above 65°; and the outer lip in an angle of above 50°; which are such degrees of steepness, that there seems no probability either that any rain which falls within the funnel, or on the inner lip of the ring, shall dash out, or that any which falls on the outer lip shall dash into the funnel. Figure 3. pl. 139. is a vertical section of the funnel, ABC and *abc* being the brass ring, BA and *ba* the inner lip, and BC and *bc* the outer.

The rain-gauge used by Mr. Luke Howard, of Plaistow, is in some respects of a peculiar construction. It consists of three parts—the funnel, the reservoir, and the scale. The funnel is 8 inches in diameter, and its cylindrical rim is an inch deep: it terminates in a pipe leading into a conical vessel, having five or six times the capacity of the funnel, and closed at its apex, which is downward, with a stop-cock. The latter enters into a glass tube, full an inch

wide, graduated from the bottom (where is placed another cock) in divisions, each corresponding to one hundredth of an inch in the cylinder of the funnel, which is not contracted above. The rain, entering by the funnel, is received in the cone, where, in case of sudden frost ensuing, it cannot injure the instrument by expansion, and where it may also be suffered to accumulate for a month, if required, with little loss by evaporation (if the conducting pipe is pretty long and narrow) and be measured off at any time. By this construction also the funnel may be placed on the roof or parapet of a house, while the reservoir and gauge may be within and more easily accessible. Both the gauges are about 30 feet from the ground. In fixing pluviometers care should be taken that the rain may have free access to them, without being impeded or overshadowed by buildings, &c.; and therefore the tops of houses are mostly to be preferred. Also when the quantities of rain collected in them, at different places, are compared together, the instruments ought to be fixed at the same height above the ground at both places; because at different heights the quantities are always different, even in the same place. And hence also, any register or account of rain in the pluviometer ought to be accompanied with a note of the height above the ground the instrument is placed at.

PLUVIERS, or **PITHIVIERS**, a town of France, in the department of Eure and Loire, 20 miles N. of Orleans. Lon. 2. 0 E. Lat. 48. 14 N.

PLUVIUS, a surname of Jupiter, invoked among the Romans, whenever the earth was parched up by continual heat. He had an altar in the temple on the capitol.

To PLY. *v. a.* (*plien*, to work at any thing, old Dutch.) 1. To work on any thing closely and importunately (*Dryden*). 2. To employ with diligence; to keep busy; to set on work (*Hudibras*). 3. To practise diligently (*Milton*). 4. To solicit importunately (*Sou.*).

To PLY. *v. n.* 1. To work, or offer service (*Spectator*). 2. To go in haste (*Milton*). 3. To busy one's self (*Dryden*). 4. (*plier*, French.) To bend (*L'Estrange*).

PLY. *s.* (from the verb.) 1. Bent; turn; form; cast; bias (*Bacon*). 2. Plait; fold (*Arbutnot*).

PLYERS. *s.* See **PLIERS**.

PLYM, a river of England, in the county of Devon, which becomes navigable at Plymouth, and falls into Plymouth Sound, a little below Plymouth.

PLYMOUTH, a seaport town of England, in the county of Devon, situated on the English Channel, at the conflux of the two rivers, Tamer and Plym, which form a harbour, capable of receiving a thousand vessels. Plymouth is defended by several forts, and a citadel. The inlet of the mouth of the Tamer is called Hamoaze, and the mouth of the Plym, Catwater. Up the Hamoaze are docks for the building of vessels, with large magazines and store-houses. Here are spacious and com-

modious barracks for soldiers; with houses for the officers, clerks, &c. with arms, stores, and all things necessary to equip a fleet; this is called Plymouth Dock, or Dock only. In the reign of Edward III. part of this town was burned by the French; and in the reign of Henry IV. 600 houses were burnt by the same enemy. During the civil wars of the last century, Plymouth adhered to the Parliament, and stood a siege of the royal army for some months. At the restoration, Charles II. built a fort between the sea and the town, which kept the inhabitants in awe, and defends the harbour. The inhabitants carry on the pilchard fishery, and a considerable trade to the Straits of Newfoundland. Plymouth contains two parish churches, and in 1801 the number of inhabitants was 19,040. It is governed by a mayor, aldermen, &c. and sends two members to the British parliament. Here are three markets weekly, viz. on Monday, Thursday, and Saturday. It is 43 miles S.W. of Exeter, and 216 W. by S. of London. Lon. 4. 7 W. Lat. 50. 21 N.

PLYMOUTH, a seaport town of United America, in the state of Massachusetts, on the west side of Cape Cod; fifteen miles S.E. Boston. Lon. 70. 40 W. Greenwich. Lat. 41. 57 N.

PLYMOUTH, a town of New Hampshire, in Grafton county, situate on the Pemigewasset, at the mouth of Baker river, 45 miles N. of Concord.

PLYMOUTH, a town of N. Carolina, on the S. side of Roanoke river, four miles above Albemarle sound, and 23 S.S.W. of Edenton.

PLYMOUTH-DOCK, the largest town in Devonshire, situate two miles N.W. of Plymouth, on an eminence between Stonehouse creek on the E. and Hamoaze on the W. It is of modern date, and owes its origin, and rapid increase, to the establishment of the dock-yard and naval arsenals along the E. bank of Hamoaze. The king's dock-yard is one of the finest in the world, occupying near 72 acres, and having all the conveniences for building and fitting out ships of war: it is separated from the town by a high wall, and both are defended by strong fortifications. The governor of Plymouth now resides here, in a handsome house overlooking the harbour from a rocky eminence. Near it are six squares of barracks; and about half a mile distant are military hospitals for the sick. The town contains one church, two chapels (a third in the dock-yard) and several meeting-houses. The market-place is large, and a market, though not chartered, is held three times a week. Its trade and population, in time of war, is very considerable: in 1801, the number of its inhabitants was 23,747, exclusive of the military and persons belonging to the navy.

PLYMPTON, a borough in Devonshire, governed by a mayor, with a market on Saturday. It had once a castle, now in ruins; and is one of the stannary towns for tin. It is seated

near the Plym, seven miles E. of Plymouth, and 218 W. by S. of London.

PLYNLIMMON, a vast and lofty mountain of Wales, partly in Montgomeryshire, and partly in Cardiganshire. The Severn, the Wye, and other rivers, have their source in this mountain. According to the accurate observations of colonel Mudge, in the Trigonometrical Survey, the altitude of this mountain is 2,463 feet, its latitude 52. 28. 3 N. and its longitude 3. 46. 4 W.

PLYNTERIA, a festival among the Greeks, in honour of Minerva. The word seems to be derived from *πλυνειν*, *lavare*, because, during the solemnity, they undressed the statue of the goddess, and washed it.

PNEUMATIC. *a.* (*πνευματικός*.) Relating to the wind; or to the air; or finally to aeriform fluids.

PNEUMATIC APPARATUS. The discovery of aeriform fluids has, in modern chemistry, occasioned the necessity of some peculiar instruments, by means of which those substances may, in distillations, solutions, or other operations, be caught, collected, and properly managed. The proper instruments for this are styled the pneumatic apparatus. Any kind of air is specifically lighter than any liquid; and therefore, if not decomposed by it, rises through it in bubbles. On this principle rests the essential part of the apparatus, adapted to such operations. Its principal part is the pneumatic trough, which is a kind of reservoir for the liquid, through which the gas is conveyed and caused to rise, and is filled either with water or with quicksilver. Some inches below its brim an horizontal shelf is fastened, in dimension about half or the third part of the trough, and provided on its foremost edge with a row of holes, into which, from underneath, short-necked funnels are fixed. The trough is filled with water sufficient to cover the shelf, to support the receivers, which being previously filled with water or mercury, are placed invertedly, their open end turned down upon the above-mentioned holes, through which afterwards the gasses, conveyed there and directed by means of the funnels, rise in the form of air-bubbles.

In some cases the trough must be filled with quicksilver, because water decomposes some kinds of air by absorbing their basis. The price and specific gravity of that metal make it necessary to give to the quicksilver trough smaller dimensions. It is either cut in marble, or made of wood well joined. The late Karsten has contrived an apparatus, which, to the advantage of saving room, adds that of great conveniency.

To disengage gasses, retorts of glass, either common or tubulated, are employed, and placed in a sand-bath, or heated by the fire of a lamp. Earthen, or coated glass retorts, are put in the naked fire. If necessary, they are joined with a metallic or glass conveying pipe. When, besides the aeriform, other fluids are to be collected, the middle or intermediate bottle finds its use; and to prevent, after cooling, the rising of the

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water from the trough into the disengaging vessels, the tube of safety is employed. For the extrication of gasses taking place in solutions, for which no external heat is required, the bottle called disengaging bottle, or proof, may be used. For receivers, to collect the disengaging airs, various cylinders of glass are used, whether graduated or not, either closed at one end, or open at both; and, in this last case, they are made air-tight by a stopper fitted by grinding. Besides these, glass-bells and common bottles are employed.

To combine with water, in a commodious way, some gasses that are only gradually and slowly absorbed by it, the glass apparatus of Parker is serviceable.

PNEUMATICS, as well as the word **PNEUMATOLOGY**, is derived from the Greek word denoting air, or, more properly, breath: but in their modern acceptation the terms differ widely, the latter denoting the science of the intellectual phenomena depending upon the operations or affections of the mind of man; while the former relates to that part of natural philosophy which treats of the mechanical properties of air, and the different elastic fluids. Thus pneumatics includes, as an important branch, the doctrine of aerostatics, common air being the most extensive and universal of the fluids which possess elasticity.

Previous to our entering upon the theoretic part of this science, it will be proper to relate some of the most obvious and natural experiments tending to prove the existence of the different mechanical affections which are usually ascribed to the air as a body: to this object we shall therefore appropriate a few of the following articles.

1. Air is a ponderous fluid which surrounds the earth.

For, that it is a fluid is obvious, because its parts are easily moved, and yield to the smallest inequality of pressure: and that it is ponderous will appear from the following considerations:

1. It always accompanies this globe in its orbit round the sun, surrounding it to a certain distance, under the name of the atmosphere, which indicates the being connected with the earth by its general force of gravity. It is chiefly in consequence of this that it is continually moving round the earth from east to west, forming what is called the trade-wind.

2. It is in like manner owing to the gravity of the air that it supports the clouds and vapours which we see constantly floating in it. We have seen bodies of no inconsiderable weight float, and even rise, in the air. Soap-bubbles and balloons filled with inflammable gas rise and float in the same manner as a cork rises in water. This phenomenon proves the weight of the air in the same manner that the swimming of a piece of wood indicates the weight of the water which supports it.

3. But we are not left to these refined observations for the proof of the air's gravity. We may observe familiar phenomena, which would be immediate consequences of the supposition that air is a heavy fluid, and, like other heavy fluids, presses on the outsides of all bodies immersed in or surrounded by it. Thus, for instance, if we shut the nozzle and valve hole of a pair of bellows, after having squeezed the air out of them, we shall find that a very great force, even some hundred pounds, is necessary for separating the boards. They are

kept together by the pressure of the heavy air which surrounds them, in the same manner as if they were immersed in water. In like manner, if we stop the end of a syringe after its piston has been pressed down to the bottom, and then attempt to draw up the piston, we shall find a considerable force necessary, viz. about 15 or 16 pounds for every square inch of the section of the syringe. Exerting this force, we can draw up the piston to the top, and we can hold it there: but the moment we cease acting, the piston rushes down and strikes the bottom. It is called a suction, as we feel something as it were drawing in the piston; but it is really the weight of the incumbent air pressing it in. And this obtains in every position of the syringe; because the air is a fluid, and presses in every direction. Nay, it presses on the syringe as well as on the piston; and if the piston be hung by its ring on a nail, the syringe requires force to draw it down (just as much as to draw the piston up); and if it be let go, it will spring up, unless loaded with at least 15 pounds for every square inch of its transverse section.

4. Let the air be exhausted from a glass vessel; and by means of a cock let the vessel be kept exhausted; if the vessel be weighed while it is exhausted, and then again when the air is re-admitted, there will be a manifest difference, exhibiting the weight of as much air as the vessel contained.

5. If a glass tube more than 31 inches in length, one end of which is closed up, be filled with mercury, and be held vertically, the other extremity being immersed in a vessel of the same fluid, then the mercury in the tube will descend from the upper extremity, and will remain suspended at some altitude between 28 and 31 inches from the surface of the external mercury: the suspension of the mercury is occasioned by the pressure of the external air upon the surface of the mercury in the vessel; when this pressure is removed by placing the tube and vessel under a receiver, and exhausting the air, the mercury will sink in the tube, and on re-admitting the air, will rise. This is called the Torricellian experiment.

The instrument here used is called a barometer; because the weight of a column of mercury whose base is the orifice of the tube, and altitude equal to that of the mercury in the tube above the surface in the reservoir, is equal to the weight of a column of air extending to the top of the atmosphere, and whose base is equal to the same orifice. And since the weight of this column of quicksilver, *ceteris paribus*, is at its altitude, it follows that the weight of the air is proportional to the altitude of the mercury in the barometer.

The altitude at which the mercury is sustained in the barometer, above the surface of the mercury in the reservoir, is called the standard altitude; and will be the same in any number of tubes, whatever be their bore or their position, provided the tube is not so very slender as to expose the mercury to a sensible alteration from the capillary attraction. The pressure of the atmosphere is equal to about 15lbs. avoirdupois upon every square inch, at the medium height of the mercury in the barometer: for a cubic foot of mercury weighs about 13568 ounces, and $\frac{13568}{1728} \times 29\frac{1}{2} = 233.6 \text{ oz.} = 14.6 \text{ lbs.}$

6. If a barometer tube, instead of being hermetically sealed at the top, be closely covered with a piece of bladder, the mercury will rise to the same height as in a common barometer; but on piercing

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the bladder with a needle so as to admit the air, the mercury will fall: for in this case the weight of the air presses upon the mercury in the tube, and the weight of these two together must obviously preponderate over the contrary pressure, and destroy the equilibrium.

II. The pressure of the atmosphere varies at different altitudes.

Let a glass tube, open at both ends, be put through a cork into a large phial containing a small quantity of coloured water; let the lower end of the tube be in the water, and let the cork and tube be closely cemented to the neck of the bottle; then blow through the tube till the quantity of air within the phial is so increased that the water will rise above the neck of the phial. Let this phial be placed in a vessel of sand to keep the air within of the same temperature: then will the water stand at different heights in the tube, according to the elevation of the place where it is set; whence it appears that the pressure of the atmosphere varies at different altitudes. And the same thing will appear more clearly in a subsequent article. In ascending the mountain of Snowden, which is 3720 feet high, the barometer sunk 3·8 inches.

Hence the proportion of the specific gravity of air near the earth's surface to that of water may be ascertained. Thus, if the difference in height of the two places where the above experiment is made be 52 feet, and that difference cause a variation of $\frac{1}{2}$ of an inch in the height of the water, it follows, that a column of water of $\frac{1}{2}$ of an inch, or $\frac{1}{16}$ of a foot, is equiponderant to a column of air of 52 feet, having the same base: consequently the specific gravity of water is to that of air as 52 to $\frac{1}{16}$, or as 832 to 1.

III. Air is elastic, or capable of compression and expansion.

This is proved by various experiments: 1. By the great expansion of a small quantity of air in a bladder apparently nearly empty, when the air is removed from the external parts in the receiver. 2. By the extrusion of a fluid from a glass bubble, by the expansion of a bubble of air contained in it. 3. By the expulsion of the white and yolk of an egg through a small hole in the little end, by the expansion of the air contained in the greater end. 4. By putting an almost emptied bladder into a small box, and laying a proper weight on the lid, which, on exhausting the air, will be raised up by the expansion of the air in the bladder. 5. Also a bladder filled with air, and just made to sink with a weight, will upon exhaustion soon rise by the expansion of the contained air. 6. Glass bubbles and images filled with water so as to make them just sink in that fluid, will, on exhausting the air from the surface, rise to the top of the vessel. 7. Beer, cyder, water, and porous bodies, emit great quantities of air under the exhausted receiver. 8. A shrivelled apple, when put under an exhausted receiver, will have its coat distended by the internal air so as to look smooth. 9. If the open end of a tube, whose other end is closed, be immersed perpendicularly in water, the space occupied by the air will be diminished, as the depth of the tube or the upward pressure of the water is increased: or, if the shorter leg of a bent tube be closed, and mercury poured into the longer, the air will be compressed in the shorter leg into a space continually decreasing as the quantity of pressing mercury is increased; and if some of the mercury be taken from the longer leg, the air in the shorter will ex-

pand and occupy a proportionably larger space. 10. The mercury may be raised by the expansion of a small quantity of confined air to the same height in an exhausted tube above the air-pump, as that to which it is raised in the mercurial gauge by the pressure of the atmosphere below it.

The limits of the condensation and rarefaction of air by human powers are not ascertained. Dr. Hales found, that when dry wood was put into a strong vessel, which it almost filled, and the remainder was filled with water, the swelling of the wood, occasioned by its imbibition of water, condensed the air of his gauge into the thousandth of its original bulk. He found that pease treated in the same way generated elastic air, which pressing on the air in the gauge condensed it into the fifteen hundredth part of its bulk. This is the greatest condensation that has been ascertained with precision, although in other experiments it has certainly been carried much further; but the precise degree could not be ascertained.

The only use to be made of this observation at present is, that since we have been able to exhibit air in a density a thousand times greater than the ordinary density of the air we breathe, it cannot, as some imagine, be only a different form of water; for in this state it is as dense or denser than water, and yet retains its great expansibility.

Another important observation is, that in every state of density in which we find it, it retains its perfect fluidity, transmitting all pressures which are applied to it with undiminished force, as appears by the equality constantly observed between the opposing columns of water or other fluid by which it is compressed, and by the facility with which all motions are performed in it in the most compressed states in which we can make observations of this kind. This fact is totally incompatible with the opinion of those who ascribe the elasticity of air to the springy ramified structure of its particles, touching each other like so many pieces of sponge or foot-balls. A collection of such particles might indeed be pervaded by solid bodies with considerable ease, if they were merely touching each other, and not subjected to any external pressure. But the moment such pressure is exerted, and the assemblage squeezed into a smaller space, each presses on its adjoining particles: they are individually compressed, flattened in their touching surfaces, and before the density is doubled they are squeezed into the form of perfect cubes, and compose a mass, which may indeed propagate pressure from one place to another in an imperfect manner, and with great diminution of its intensity, but will no more be fluid than a mass of soft clay.

IV. The elastic force of the air is equal to the force of compression.

For if the air be exhausted from an open tube whose lower part is immersed in a vessel containing mercury, the air within the vessel being prevented from escaping, then will this air by its elasticity force the mercury up the tube very nearly to the same height as it would be raised by the pressure of the atmosphere.

This proposition is sometimes proved independent of experiments in the following manner: if the force with which the air endeavours to expand itself when it is compressed were less than the compressing force, it would yield still further to that force; if it were greater, it could not have yielded so far. Consequently, when any force has so compressed the air that it remains at rest, the force

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of the air arising from its elasticity can neither be greater nor less than the compressing force; that is, it must be equal to it.

But it must be confessed that, in this case, the experimental proof is the most satisfactory.

V. The elasticity of air not very different from its natural state is inversely as the space occupied by it.

1. Let a cylindrical tube BC (fig. 4. pl. 139.), open at one end B, be filled with mercury to an altitude equal to BD before inversion, and after the immersion of B in a basin of mercury, the air, which before occupied a space equal to CD, is dilated through a larger space as CA, and if BN be the standard altitude (art. I. 5.), depresses the mercury from N to A. Now the elastic force of air in its natural state, or occupying a space equal to CD (E), is to the elastic force of air occupying the space BD (e) as the columns of mercury which they are capable of supporting (art. 4.); that is, as BN to AN: but it is collected from experiments that BN : AN :: AC : CD; consequently AC : CD :: E : e.

And the same thing may be otherwise shown by experiments with bent tubes.

Hence since the density of the air is inversely as the magnitude of space occupied (art. 10.), it is, therefore, as the elasticity, or as the compressing force (art. 4.): so that, putting D for the density, C the compressing force, E the force of elasticity, and S the space, we have $C \propto D \propto E \propto \frac{1}{S}$. These relations, however, are confined within very narrow limits, for it has been asserted that when the air is compressed into a space only four times less than the space it occupies in its natural state, it does not then vary inversely as the force of compression, the resistance increasing much more rapidly. Comment. Bonon. vol. I. p. 209, &c.

The experiments of Boyle, Mariotte, and Amontons, were not extended to very great compressions: so that they found generally that the elasticity of the air was proportioned to its density; and the law was long acquiesced in, being called the Boylean law. But later philosophers have carried the compression much further. Thus Sulzer compressed air into $\frac{1}{8}$ of its former dimensions: the results of his experiments are exhibited in the following table, where the column D shows the densities, and those marked E the corresponding elasticities,

First Set.		Second Set.		Third Set.	
D	E	D	E	D	E
1 000	1 000	1 000	1 000	1 000	1 000
1 100	1 093	1 236	1 224	1 091	1 076
1 222	1 211	1 294	1 288	1 200	1 183
1 375	1 284	1 375	1 332	1 333	1 303
1 571	1 599	1 466	1 417	1 500	1 472
1 692	1 669	1 571	1 515	1 714	1 659
1 833	1 796	1 692	1 647		
2 000	1 938	2 000	1 964	2 000	1 900
2 288	2 130				
2 444	2 375	2 444	2 392	2 400	2 241
3 143	2 936	3 143	3 078	3 000	2 793
3 666	3 391	3 666	3 575		
4 000	3 706			4 000	3 631
4 444	4 035	4 444	4 320		
4 888	4 438				
5 500	4 922	5 500	5 096		
5 882	5 522	7 333	6 694	6 000	5 297
				8 000	6 835

Other experiments for the same purpose were instituted by professor Robison, the results of which may be seen below.

Dry Air.		Moist Air.		Camp. Air.	
D	E	D	E	D	E
1 000	1 000	1 000	1 000	1 000	1 000
2 000	1 957	2 000	1 920	2 000	1 909
3 000	2 848	3 000	2 839	3 000	2 845
4 000	3 737	4 000	3 726	4 000	3 718
5 500	4 930	5 500	5 000	5 500	5 104
6 300	5 342	6 000	5 452	6 000	5 463
7 620	6 490	7 620	6 775	7 620	6 812

Here it appears again in the clearest manner that the elasticities do not increase so fast as the densi-

ties, and the differences are even greater than in Mr. Sulzer's experiments.

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The second table contains the results of experiments made on very damp air in a warm summer's morning. In these it appears that the elasticities are almost precisely proportional to the densities + a small constant quantity, nearly 0.11, deviating from this rule chiefly between the densities 1 and 1.5, within which limits we have very nearly $D = E^{1.007}$. As this air is nearer to the constitution of atmospheric air than the former, this rule may be safely followed in cases where atmospheric air is concerned, as in measuring the depths of pits by the barometer.

The third table shows the compression and elasticity of air strongly impregnated with the vapours of camphire. Here the Boylean law appears pretty exact, or, rather, the elasticity seems to increase a little faster than the density.

VI. Heat increases the elasticity of the air, and cold diminishes it. Or, heat expands and cold condenses the air.

This property is likewise proved by experience.

1. Tie a bladder very close with some air in it, and lay it before the fire: then as it warms it will more and more distend the bladder, and at last burst it, if the heat be continued, and increased high enough. But if the bladder be removed from the fire, as it cools it will contract again, as before. Indeed it was upon this principle that the first air-balloons were made by Montgolfier: for, by heating the air within them, by a fire underneath, the hot air distends them to a size which occupies a space in the atmosphere, whose weight of common air exceeds that of the balloon.

2. Also, if a cup or glass, with a little air in it, be inverted into a vessel of water; and the whole be heated over the fire, or otherwise; the air in the top will expand till it fill the glass, and expel the water out of it; and part of the air itself will follow, by continuing or increasing the heat.

Many other experiments to the same effect might be adduced.

The expansion of air, though exposed to the same degree of heat, is not the same in experiments made at different times, owing to the difference of density, coldness, humidity, &c. The expansive force of hot steam may exceed the force of gunpowder more than 30 times, and indeed is irresistible when the force is intense. Hence it follows, that when air is much impregnated with water it will possess an expansive power by heat, much greater than that of pure air. Whether the degree of expansion in pure air be proportional to that of the heat by which it is produced, is not known; but it is manifest that the variation of space occupied by a portion of air exposed to different degrees of heat may be sufficient to convey a tolerable idea of the actual quantity of heat. Upon this principle, therefore, have been constructed air thermometers, to exhibit small variations of heat.

There is no general rule for the degree of expansion to which different bodies are subject by being exposed to the same degree of heat. Taking an average, however, it has been found, by experiment, that for each degree of heat measured, by Fahrenheit's thermometer, mercury, water, and air, expand by the following parts of their own bulk, viz.

Mercury the 9600th	} part of its own bulk.
Water..... 6666th	
Air 435th	

In mercury the corresponding expansions for 1° gradually diminish, being expressed by .0001177 at 2° of the thermometer, and by .0000783 at 212°:

but at 12° the expansion corresponding to a degree of variation in heat is .0001160, and at 102° it is .0001003, so that between these limits the variation in the measure of expansion is very trifling. Taking into the estimate the changes in the expansion, &c. the specific gravities of these fluids at different temperatures have been stated as below.

Spec. grav. of air 1	} when the barom. is at 29.27, and the thermom. at 53°.
water . . . 836	
mercury 11365	
Or thus, air 1	} when the barom. is 29.27, and the thermom. at 55°.
water 832	
mercury . 11315	
Or thus, air 1	} when the barom. is 29.5, and the thermom. is . . . 55°, which are their mean heights in this country.
water 826	
mercury . 11227	
Or thus, air . 1.201 or 1 $\frac{1}{5}$	} in the last circumstances.
water . . . 1000	
mercury . 13592	
Or thus, air 1.222	} nearly when the barom. is . . . 30, and the thermom. 55.
or 1 $\frac{1}{5}$	
water . . . 1000	
mercury 13600	

On this subject the student may advantageously consult general Roy's paper in the Phil. Trans. vol. 67. Also sir Geo. Shuckburgh's and M. De Luc's papers in the same volume.

Equilibrium of elastic fluids.

VII. PROP.—To investigate equations of equilibrium for elastic fluids.

This will be very easy, if we consider that such fluids must, from the nature of perfect elasticity, occupy a smaller space in proportion as the forces which compress them are greater, and restore themselves to their primitive volumes, when the action of the compressing forces cease. Let, then, P be a pressure exerted upon a quantity M of the fluid, whose density is D ; p another pressure, m the mass or volume the fluid takes in consequence of this pressure, and d the density of this mass; so shall we have these equations:

$$PM = pm, MD = md, \text{ and } Pd = pD \dots\dots (I.)$$

When $P = p$, then $M = m$, as is obvious.

These values only give the pressures exerted upon a unit of surface; but if we drop the consideration of gravity, or any other force which may cause a variation of density in the different parts of the fluid, we may then reason from the principles of hydrostatics. This granted, the pressure p exerted upon any surface denoted by a will be

$$p = \frac{ad}{D}P, \text{ or } p = \frac{aM}{m}P \dots\dots\dots (II.)$$

Pressures being commonly valued by weights, we may represent that which is exerted upon a unit of surface by the weight of a prism of the same fluid whose height will be given. Let H be the height corresponding to P , and h to p ; then we have HD for the mass of this prism, and HDg its weight (g denoting the force of gravity): hence $P = HDg$; and in like manner $p = hdg$. Substituting these for P and p in the equations marked (I.) above, we have $hD = Hd$, and $hm = HM$. Whence we learn that the property of non-elastic fluids obtains likewise with regard to elastic fluids.

Instead of taking the same fluid, we may employ

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another whose density is δ ; and, by proceeding in a similar manner, get the following general equation for the pressure,

$$p = \frac{M}{m} ag\delta H = \frac{d}{D} ag\delta H \dots \dots \dots (III.)$$

Many other equations might be deduced with equal facility; but those here given are among the most useful.

VIII. PROP.—If an elastic fluid be quiescent, and composed of particles equally repulsive at equal distances, and at unequal distances, repelling each other according to any law of the distance, its density will be uniform.

For if the distances of any two particles from an intermediate particle be unequal, their repulsive forces must be unequal, and, of consequence, motion must ensue; which is contrary to the hypothesis: therefore the fluid must have its particles at equal distances, or be uniformly dense.

COR.—If any portion of an elastic fluid be uniformly dense, and equally compressed on all sides, it must be quiescent.

IX. PROP.—If the component particles of a uniform cubical mass of a fluid repel each other, with forces varying according to any inverse or direct ratio of their distances (less than the direct duplicate), the fluid will be elastic.

For the whole repulsive force of any surface of the fluid is as the number of particles in that surface, and the force of each, or as the number in L the length of that surface, into the number in B the breadth, into the force of each particle; or, substituting R for the whole repulsive force of the surface, I for the interval or distance between two contiguous particles, and F for the force with which they repel each other, R will vary as $\frac{F}{I^2}$.

Hence, if F vary in any inverse ratio, or any direct ratio less than the duplicate ratio of I , R will vary in some inverse ratio of I , which is a necessary condition of elastic fluids.

X. PROP.—If the particles of an elastic fluid repel each other with forces varying inversely, as the n th power of their distances, that is, as $\frac{1}{I^n}$, and the compressing force C upon any surface be equal to its whole repulsive force R , then will C vary as that power of the density D , whose exponent is $\frac{n+2}{3}$.

For, let a portion of the fluid be contained in a given cubic space, one of whose faces is the rectangle of $L \times B$, the compressing force being applied to that surface. Now, the number of particles in the given square surface is as $\frac{1}{I^2}$; and, by hypothesis, the force F , with which two particles repel each other, is as $\frac{1}{I^n}$; therefore the elastic force of the fluid, and of consequence the compressive force C , is as $\frac{1}{I^2} \times \frac{1}{I^n}$, or as $\frac{1}{I^{n+2}}$. But the density of the fluid contained in the given cubical space is inversely as the cube of the distance between the centres of the particles; that is, $D \propto \frac{1}{I^3}$, and

$I \propto \frac{1}{D^{\frac{1}{3}}}$: whence, by substituting $D^{-\frac{1}{3}}$ for I , in

the expression $C \propto \frac{1}{I^{n+2}}$, we have $C \propto D^{\frac{n+2}{3}}$.

COR. 1. Conversely, if $D^{\frac{n+2}{3}}$ vary as C , the repulsive force of each particle, or F , must vary as $\frac{1}{I^n}$.

For the quantity of matter being given, $D \propto \frac{1}{L^3}$

$\propto \frac{1}{I^3}$ and $D^{\frac{n+2}{3}}$ will vary as $\frac{1}{I^{n+2}}$: but F varies

as C divided by the number of particles in L^2 ,

or as $C \times I^2$, or $\propto D^{\frac{n+2}{3}} \times I^2$, or $\propto I^2 \div I$ or

$\propto \frac{1}{I}$.

COR. 2. Hence again we see, since $n+2$ must be always positive to make C positive, that n must be either some whole positive number, or a negative number less than 2, in order to constitute a fluid of particles which repel each other.

COR. 3. If water be supposed compressible in a very small degree, the particles must be kept at a distance by some repulsive force, while D remains

nearly constant. Now, since $C \propto D^{\frac{n+2}{3}}$, we shall

have $D \propto C^{\frac{3}{n+2}}$; in which, that $C^{\frac{3}{n+2}}$ may be nearly invariable, n must be a very great number: hence, according to this hypothesis, the repulsive force of the particles of water varies inversely in a very high power of their distances.

COR. 4. When the density of the fluid varies as the force which compresses it, or $D \propto C$, the ex-

pression $C \propto D^{\frac{n+2}{3}}$ becomes $C \propto D^{\frac{1+2}{3}}$ and $n=1$;

whence $F \propto \frac{1}{I^n}$ becomes $F \propto \frac{1}{I}$, or the force of each particle is inversely as the interval between two contiguous particles.

COR. 5. Hence, because the density of the air is nearly proportional to the force which compresses it, (art. 4.) its constituent particles must repel one another with forces varying inversely as their distances.

COR. 6. The density of the air varying as the compressing force, and that perpetually decreasing in ascending the atmosphere, the density and elasticity of the air also perpetually decrease.

DEF. A homogeneous atmosphere is an atmosphere supposed to be of the same weight as that which actually surrounds the earth; its density being uniform, and every where equal to the density of the air at the earth's surface.

XI. PROP.—To find the altitude of a homogeneous atmosphere.

Let H be the height of the homogeneous atmosphere, its uniform density being D , the same as the density of the air pressing upon the mercury in the basin of the barometer; h the height of the mercury in the barometer tube, and d the density of that fluid: then (art. 7.) we have $M=m$, or $HD=hd$,

$$\text{whence } H = \frac{hd}{D}.$$

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Now it appears from article 6, that when the densities of air and mercury D and d are as $1\frac{1}{2}$ and 13600, the height h of the mercury in the barometer is $2\frac{1}{2}$ feet.

$$\text{Hence } H = \frac{hd}{D} = \frac{13600 \times 2\frac{1}{2}}{1\frac{1}{2}} = 27818 \text{ feet,} =$$

5.268 miles. So that the height of the homogeneous atmosphere is rather more than $5\frac{1}{4}$ miles.

COR. 1. If it were not for the changes of temperature, the height H of the homogeneous atmosphere would be invariable whatever might be the height of the mercury in the barometer.

For if d be constant, because the specific gravity of air varies as D its density, and this again as h , the height of the mercury in the tube, it follows that $\frac{h}{D}$ is invariable, and consequently $H = \frac{hd}{D}$ is constant likewise.

XII. PROP.—Supposing the force of gravity to vary as the n th power of the distance from the centre of the earth, and the compressive force to vary as the density, to find the relation between the density of the air and the altitude above the surface of the earth.

Let x represent the variable distance from the surface of the earth, the radius of the earth being unity, d the density of the air at the distance x , and H the height of the homogeneous atmosphere. Now, since by hypothesis the compressing force varies as the density, the fluxion of the former will vary as the fluxion of the latter: while, at any distance, x the fluxion of the compressing force must vary as the force of gravity, the density, and the fluxion of the altitude, conjointly; so that the fluxion of the compressing force will be to that of

the density in the constant ratio of $x \cdot d \cdot \dot{x}$ to $-\dot{d}$, the latter fluxion having the negative sign, because the density decreases while the altitude increases. Consequently, since by the definition of a homogeneous atmosphere H will represent the compressing force at the surface of the earth, we have

$$H:1::x \cdot d \cdot \dot{x}:-\dot{d}, \text{ whence } x \cdot \dot{x} = -H \times \frac{\dot{d}}{d}, \text{ and}$$

$$\frac{n+1}{n+1} = -H \cdot \text{hyp. log. } d + C.$$

Now to correct the fluent we must consider that, when $x=1, d=1$; whence we find $C = \frac{1}{n+1}$ for the value of the constant quantity: and the correct

$$\text{fluent is } \frac{x^{n+1}}{n+1} = \frac{1}{n+1} - H \cdot \text{hyp. log. } d. \text{ Hence}$$

$$\frac{1-x^{n+1}}{n+1} = H \cdot \text{hyp. log. } d.$$

which is the general equation expressing the relation between the altitude and the density.

COR. 1. When the force of gravity varies inversely as the square of the distance, $n = -2$, and

$$\frac{1-x^{-1}}{-1} = H \cdot \text{hyp. log. } d, \text{ becomes } \frac{1}{x} - 1 = H \cdot \text{hyp. log. } d. \text{ So that if } x \text{ increase in harmonic pro-}$$

gression, $\frac{1}{x}$ will decrease in arithmetic progression, and consequently hyp. log. d will decrease in arithmetic progression.

COR. 2. If the force of gravity be supposed constant $n=0$, and $1-x=H \cdot \text{hyp. log. } d$. Consequently, if x increase in arithmetic progression,

since $1-x$ will then decrease in arithmetic progression, the hyp. log. of d will decrease in arithmetic progression.

COR. 3. Since the hyperbolic logarithms are to the common logarithms in a constant ratio, viz. that of 1 to .43429448, &c. it follows that when x increases in arithmetic progression the common logarithms of the densities will decrease in arithmetic progression, and the densities themselves in geometrical progression, on the supposition of equal gravity.

COR. 4. Hence, retaining the same hypothesis; different altitudes above the earth's surface will vary as the negative logarithms of the densities or weights of air at those altitudes. So that if D and d denote the densities at the heights H and h , since

$$H \propto -\log. D, \text{ and } h \propto -\log. d, \text{ the difference}$$

$$H-h \propto -\log. D - (-\log. d) \propto \log. D - \log. d,$$

or $\propto \log. \frac{D}{d}$. And if $H=0$, or $D=\text{the density at the earth's surface}$, then any altitude above the surface is as the log. of $\frac{D}{d}$. Or generally the log.

of $\frac{D}{d}$ varies as the altitude of the one place above

the other, whether the lower place be at the surface of the earth or not: and upon this property is founded the method of finding the heights of mountains, &c. by the barometer. See ATMOSPHERICAL LOGARITHMIC.

On the motion of air when the equilibrium of pressure is removed.

XIII.—Here we shall consider air (taken for a representative of elastic fluids in general) as acted upon by gravity equally and in parallel directions; and in a series of propositions enquire into the circumstances of its passage from a vessel into a vacuum, or from one vessel to another, in which the air is of less density.

PROP. To determine with what velocity air will rush into a void space when impelled by its weight alone.

This is manifestly analogous to the hydraulic problem of water flowing through an orifice in the bottom or side of a vessel, and the manner of demonstration there adopted will immediately apply to the present instance. For when the moving force, and the matter to be moved, vary in the same proportion, the velocity will continue the same; that is, since $F \propto BV$, when $F \propto B, V$ is constant.

If, therefore, there be similar vessels of air, water, oil, or any other fluid, all of the height of a homogeneous atmosphere, they will be discharged through equal and similar holes with the same velocity: for, in whatever proportion the quantity of matter moving through the hole be varied by a change of density, the pressure which forces it out, acting in circumstances perfectly similar, varies in the same proportion. Hence it follows, that air rushes from the atmosphere into a void with the velocity which a heavy body would acquire by falling from the top of a homogeneous atmosphere.

Let us take, then, for the height of the homogeneous atmosphere $H=27818$ feet (art. 11.); and if we put $g=32\frac{1}{2}$ feet, as we have heretofore

done, we shall have $V = \sqrt{2gH} = 1339$ feet nearly $\approx 8\sqrt{H}$ nearly, the velocity sought: no regard being here paid to the velocity which the air ac-

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quires after its issuing into the previous void, by its continual expansion.

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XIV. The first solution to this problem we recollect was given by Dr. Papin in the Phil. Trans. No. 184. See also the new abridgment, part x. p. 334. It is deduced from this proposition, viz. that of different liquors under the same pressure, those specifically lighter must acquire a greater celerity, and their different velocities will be to one another as the roots of the specific gravities of the said liquors. "If, therefore," says Dr. Papin, "we would know what is the velocity of air when driven by any degree of pressure whatever, we need only find what would be the velocity of water under the same pressure, and then take the square roots of the specific gravities of these two fluids, because, as much as the square root of the specific gravity of water exceeds the square root of the specific gravity of the air, so much in proportion will the velocity of the air exceed that of the water. For example, when I would compute what would be the velocity of a bullet shot by the pneumatic engine, described in Phil. Trans. No. 179, I should first compute what was the velocity of the air itself that drove the bullet: I therefore observe that on this occasion the air sustains a pressure much about the same as that of water when its head is 32 feet high; now such water would spout out with a sufficient velocity to ascend 32 feet perpendicular, and therefore it has the velocity of 45 feet in a second. It remains, therefore, only to know the proportion of the gravity of air to that of water: this we have found not to be always the same, because the height, the heat, and the moisture of the atmosphere, are variable; yet we may say in general, that the ratio of the specific gravities of water and air is about 840 to 1. Taking then their square roots, which are 29 and 1, we may conclude that the velocity of air must exceed that of water 29 times; and so multiplying 45, the velocity of water, by 29, we shall find that the velocity of the air, driven by the whole pressure of the atmosphere, is about 1305 feet in a second."

This number, as Dr. Hutton remarks, is too small; for the mean pressure of the atmosphere is now known to be about that of a column of water of 33½ feet, and this will give for its velocity 46½ feet, instead of 45; which, multiplied by the 29, gives nearly 1348 feet: a determination which differs from that in the preceding article by about its 150th part.

XV. PROP.—To determine the velocity with which the air of the atmosphere will rush into a space containing rarer air.

Whatever the density of the rarer air may be, its elasticity, which varies as its density, will balance a proportional part of the pressure of the atmosphere; and it is the excess of this last only which is the moving force, the matter to be moved is the same as before. Let D then be the natural density of the air, and δ the density of the air contained in the vessel into which it is supposed to run: let P be the pressure of the atmosphere, and therefore equal to the force which impels it into a void, and π the force with which this rarer air would run into a void. Then (art. 7.) we have $P\delta = \pi D$,

and $\pi = \frac{P\delta}{D}$. Also the moving force in the present case is $P - \pi$, or $P - \frac{P\delta}{D}$. Lastly, let V be the velocity of air of density D rushing into a void,

and v the velocity with which it will rush into the rarified air of density δ . Now, in this as well as other fluids, the pressures are as the squares of the

velocities of efflux: therefore $P : P - \frac{P\delta}{D} :: V^2 : v^2$,

and by reduction we find $v = V \times \sqrt{1 - \frac{\delta}{D}}$; an

expression for the velocity sought, not considering the resistance which the air of density D will experience from the inertia of that in the vessel, which it must displace in its motion.

COR. 1. Hence it appears that there will always be a current into the vessel while δ is less than D .

COR. 2. Hence, also, we learn the gradual diminution of the velocity as the vessel fills; for, because δ gradually increases, $1 - \frac{\delta}{D}$, and conse-

quently the value of v continually diminishes.

XVI. PROP.—To determine the time t in seconds, in which the air of the atmosphere will flow into a given vessel from its state of vacuity, till the air in the vessel has acquired any proposed density δ .

Let H be the height in feet due to the velocity V , s the solid content or capacity of the vessel in cubic feet, and a the area or section of the aperture in square feet, D representing, as before, the natural density of the air. Now, since the quantity of air to fill the vessel will depend upon its density and the capacity of the vessel conjointly, we may express it by Ds when the air is in its ordinary state, and by δs when it has acquired the density δ . To find the rate at which the vessel fills we must take the fluxion of the quantity δs , which will be $s\dot{\delta}$, because s is invariable. The velocity of influx

at the first instant is V or $\sqrt{2gH}$, and when the air in the vessel has acquired the density δ , that is, at the end of the time t , the velocity is $\sqrt{2gH} \times$

$\sqrt{1 - \frac{\delta}{D}}$, or $\sqrt{2gH} \cdot \frac{D - \delta}{D}$. Hence the rate

of influx, which may be measured by the indefinitely small quantity of air which will enter during the time t with this velocity, will be denoted by

$\sqrt{2gH} \times \sqrt{\frac{D - \delta}{D}} \times D a t = a t \sqrt{2gDH (D - \delta)}$.

Making these two values of the rate of influx equal,

we have $a t \sqrt{2gDH (D - \delta)} = s\dot{\delta}$, or $t = \frac{s}{\sqrt{2gDH}} \times \frac{\dot{\delta}}{D - \delta}$. Taking the fluents, we have $t =$

$\frac{s}{\frac{1}{2} a \sqrt{2gDH}} \times \sqrt{D - \delta} + C$.

To determine the constant quantity C we must recollect that when $t = 0$, $\delta = 0$, and $\sqrt{D - \delta} = \sqrt{D}$; hence $C = \sqrt{D}$, and the correct fluent is

$t = \frac{s}{a \sqrt{\frac{1}{2}gDH}} \times (\sqrt{D - \delta} - \sqrt{D})$.

COR. When $\delta = D$ the motion ceases, in which case t becomes $\frac{s\sqrt{D}}{a \sqrt{\frac{1}{2}gDH}}$, or $\frac{s}{a \sqrt{\frac{1}{2}gH}}$, or $\frac{s}{4a\sqrt{H}}$ nearly, for the time of completely filling the vessel.

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XVII.—To illustrate this by an example in numbers, let us suppose the capacity of the vessel to be 8 cubic feet, or nearly a wine hogshead, and that the orifice by which the air of the ordinary density (which we shall make=1) enters, is an inch square, or $\frac{1}{144}$ of a foot. Here $4\sqrt{H}=4\sqrt{27818}=668$, and $t=\frac{8}{\frac{1}{144} \cdot 668}=\frac{1152}{668}=1.7245$. If

the hole be only $\frac{1}{100}$ of a square inch, or the side $\frac{1}{10}$ of an inch, the time of completely filling the vessel will be nearly $172\frac{1}{2}$ seconds, or rather less than 3 minutes.

If we make the experiment with a hole cut in a thin plate, we shall find the time greater nearly in the ratio of 62 or 63 to 100. As is likewise the case with water flowing through small orifices, and for similar reasons.

In like manner we can find the time necessary for bringing the air in the vessel to $\frac{1}{4}$ of the ordinary density. For the only variable part of the correct

fluent above is $\sqrt{D-\delta}$, which in this case becomes

$\sqrt{1-\frac{1}{4}}=\sqrt{\frac{3}{4}}=\frac{\sqrt{3}}{2}$, whence $\sqrt{D}-\sqrt{D-\delta}=\frac{\sqrt{3}}{2}$. And if the hole is a square, each side being $\frac{1}{10}$ of an inch, the time is $\frac{1}{4}$ of $172\frac{1}{2}$, that is, $86\frac{1}{4}$ seconds.

XVIII. PROP.—Let the air in the vessel ABCD (fig. 5, pl. 139.) be compressed by a weight acting on the cover AD, which is moveable down the vessel, to determine the velocity of the air expelled at the aperture C.

The density D of the external air corresponds to its pressure P: and, since the immediate effect of the external pressure is to compress the air in the vessel and give it another density, let the additional pressure on the cover of the vessel be p , and the density of the air in the vessel be d ; then shall we

have $P : P+p :: D : d$; whence $p = P \times \frac{d-D}{D}$. Now,

because the pressure which expels the air is the difference between the force which compresses the air in the vessel and that which compresses the external air, the expelling force is p , and because the quantities of motion are as the forces which similarly produce them, we shall have $P : P \cdot \frac{d-D}{D} ::$

$MV : mv$, where M and m express the quantities of matter expelled, V the velocity with which air rushes into a vacuum, and v the velocity required. But because the quantities of aerial matter which issue from the same orifice in an instant are as the densities and velocities jointly, we shall have $MV :$

$mv :: DVV : dvv$. Consequently $P : P \cdot \frac{d-D}{D} :: DV^2 :$

dv^2 . And hence we deduce $v = V \sqrt{\frac{d-D}{d}}$.

COR. Another expression for the velocity may be obtained without considering the density: for since $P : P+p :: D : d$, therefore $d = \frac{D(P+p)}{P}$, and

$d-D = \frac{D(P+p)}{P} - D = \frac{D(P+p) - DP}{P} = \frac{Dp}{P}$;

whence $\frac{d-D}{d} = \frac{DP}{P} \cdot \frac{D(P+p)}{P} = \frac{p}{P+p}$. Substitut-

ing this value of $\frac{d-D}{d}$ for it in the final value of v,

it becomes $v = V \sqrt{\frac{p}{P+p}}$, which is both a simple and convenient expression.

XIX. PROP.—To enquire into the effect of the air's elasticity, when ascertaining the velocity with which the air will issue from a vessel into a vacuum.

Let ABCD (fig. 5, pl. 139.) be a vessel containing air of any density D. This air is in a state of compression, and if the compressing force be removed it will expand, and its elasticity will diminish with the density. Now its elasticity in any state is measured by the force which keeps it in that state (art. 4.); and the force which keeps common air in its ordinary density is the pressure of the atmosphere, which (art. 1.) is at a medium the same with the weight of a column of mercury $29\frac{1}{2}$ inches high. If, therefore, we suppose that this air, instead of being confined by the top of the vessel, is pressed down by a moveable piston carrying a cylinder of mercury of the same base, and $29\frac{1}{2}$ inches high, its elasticity will balance this pressure just as it does the pressure of the atmosphere: and, since it is a fluid, and propagates through every part and in every direction the pressure exerted on any one part, it will press on any small portion of the vessel by its elasticity, in the same manner as when loaded with this column. Hence, if this small portion of the vessel be removed, and a passage made into the void, the air will begin to flow out with the same velocity as it would flow out when impelled by its weight alone, or with the velocity acquired by falling from the top of the homogeneous atmosphere; that is, a velocity of 1339 feet nearly (art. 13.). But as soon as any air has passed through the orifice, the density of that remaining in the vessel is diminished, and its elasticity is diminished, consequently the expelling force is diminished: but the matter to be moved is diminished in the very same proportion as the density, the capacity of the vessel remaining unchanged: therefore, since the density and elasticity follow the same law, the quantity of matter moved will vary as the moving force, and the velocity will continue the same from the beginning to the end of the efflux.

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XX.—Hence, since the velocity with which the air issues out of such a vessel is constant, we may readily compare the velocity of theory in art. 13, with that found by experiment. But for this purpose we shall here describe the simple apparatus and experiments of Mr. Banks, in which a change of density is avoided. (Banks on the Power of Machines, p. 10.) A (fig. 6. pl. 139.) is a cask of known capacity, into the top of which is screwed an aperture a of a known area. The tube Td, recurve at d, is soldered or screwed into the top of the said cask. The hole a is stopped, and water poured into the tube T till it is full; at which time a quantity of water will have passed out of the tube at d, and condensed the air in the cask till its spring is equal to the weight of the water in the tube. At this time a cock placed over the tube T, sufficiently large to supply water as fast as it can descend into the vessel A, must be opened to keep the tube constantly filled: for this purpose one person must attend it, and another must open the aperture a, which need only have been closed by a finger, and he must measure the seconds from the moment that the finger is removed till

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the water flies out at the jet. Hence, from knowing the capacity of the vessel and the area of the jet, the velocity may be obtained. If the tube Td should be continued nearly to the bottom of A, while A was filling with water, the length of the compressing column would be gradually diminished, and of consequence the pressure would be constantly changing: to avoid any irregularity this might produce, the open end of the tube is as near the top of the cask as is consistent with a free passage for the water.

Experiments. The vessel contained 15lb. 6oz. of water; from which we find its capacity 425.088 cubic inches. The area of the aperture a , through which the air is discharged, is .0046 inches.

- Exp. I. $\left\{ \begin{array}{l} \text{The altitude of T above the cask 30 inches;} \\ \text{Time of expelling the air } 33^s, \text{ by several trials.} \end{array} \right.$
- Exp. II. $\left\{ \begin{array}{l} \text{The altitude of T 6 feet;} \\ \text{Time of expelling the air } 21.3^s, \text{ by several trials.} \end{array} \right.$

In the first experiment 425.088, the capacity of the cask, being divided by .0046, the area of the hole, gives 92410.4 inches, for the length of the

stream driven out in 33^s. Hence $\frac{92410.4}{12 \times 33} = 233.3$ feet, the velocity per second.

From the second experiment we deduce, by a similar process, 361.6 feet, for the velocity per second: and, to show the correspondence of this with the first, say, as $\sqrt{24}$ (the head) : 233.3 :: $\sqrt{6}$ (the head) : 361.8 feet; differing from the former by only a fifth of a foot.

To compare the velocity thus found by experiment with that assigned by theory (art. 13), we may say, as $\sqrt{6}$: 361.6 :: $\sqrt{33}$ (the height of a column of water equivalent in pressure to the atmosphere) : 845.2 feet, the velocity with which the atmosphere would begin to enter into a vacuum. Making the allowance spoken of in art. 17, we shall have $1339 \times .63 = 843.57$, agreeing as nearly with the experimental result as can reasonably be expected.

XXI. PROP.—To find the quantity of aerial matter which will be expelled from the orifice C of the vessel ABCD (fig. 5.) during any time t , and the density of the remaining air at the end of that time.

In the element of time i there issues (by art. 16.)

the capacity of air $ai\sqrt{2gH}$, the velocity V being constant (art. 19.), and consequently the quantity

of air $adi\sqrt{2gH}$. On the other hand, the quantity of air at the beginning of the efflux was sD , s being, as before, the capacity of the vessel; and when the air has acquired the density d , the quantity in the vessel is sd , and $sD - sd$ is the quantity expelled: consequently the quantity discharged

in the element of time i must be the fluxion of $sD - sd$; that is, $-sd$. Hence we have the equation

$adi\sqrt{2gH} = -sd$, and $i = \frac{-sd}{ad\sqrt{2gH}} = \frac{s}{a\sqrt{2gH}} \times$

$-\frac{d}{a}$. The fluent of this is $t = \frac{s}{a\sqrt{2gH}} \times \text{hyp. log.}$

d . Now this fluent must be so taken that when $t=0$, $d=D$, or $\text{hyp. log.} \frac{D}{d} = \text{hyp. log. } 1 = 0$. So

that the correct fluent is $t = \frac{s}{a\sqrt{2gH}} \times \text{hyp. log.} \frac{D}{d}$.

$\frac{s}{8a\sqrt{H}} \times \text{hyp. log.} \frac{D}{d}$, nearly.

COR. Hence it follows that the whole air of a vessel situated as in the proposition will not flow out of it into a void, in any finite time whatever.

XXII. PROP.—To determine the time when the vessel, instead of discharging its air into a void, emits it into air of a less density, that density remaining invariable during the efflux; as may be supposed the case when a vessel holding condensed air emits it into the surrounding atmosphere.

Let the initial density of the air in the vessel be δ , and that of the atmosphere D . Then it is manifest that the expelling force is $P - \frac{PD}{\delta}$ (art. 15.);

and that after the time t it is $\frac{Pd}{\delta} - \frac{PD}{D}$. We have

therefore $\frac{P\delta - PD}{\delta} : \frac{Pd - PD}{D} :: MV : mv :: \delta V^2 : dv^2$;

whence, by reduction, we have $v = V \sqrt{\frac{d(D-D)}{d(D-D)}}$.

From which equation we may learn, that when $d=D$ the motion will be at an end; and that if $\delta=D$ there can be no efflux.

Now, to find the relation between the time and the density, let H , as before, be the height due to the velocity V . Hence the height due to the

velocity of efflux v must be $H \times \frac{\delta(D-D)}{d(D-D)}$, and the

small parcel of air which will flow out in the element of time i will be $adi \sqrt{2gH \frac{\delta(D-D)}{d(D-D)}}$. And

another expression for the same is, as in the preceding article, $-sd$. Making these two values

equal, we soon deduce the fluxionary equation $i =$

$\frac{s\sqrt{\delta-D}}{a\sqrt{2g\delta H}} \times \frac{-d}{\sqrt{d^2-dD}}$. The fluent of this, so corrected that when $t=0$, $d=\delta$, is

$t = \frac{s}{a} \times \sqrt{\frac{\delta-D}{2g\delta H}} \times \text{hyp. log.} \left(\frac{\delta - \frac{1}{2}D + \sqrt{\delta^2 - \delta D}}{\delta - \frac{1}{2}D + \sqrt{\delta^2 - dD}} \right)$.

COR. When d becomes $= D$ the efflux is complete, and the expression for the time will then become

$t = \frac{s}{a} \times \sqrt{\frac{\delta-D}{2g\delta H}} \times \text{hyp. log.} \left(\frac{\delta - \frac{1}{2}D + \sqrt{\delta^2 - \delta D}}{\frac{1}{2}D} \right)$.

XXIII. PROP.—Let the capacities of two vessels containing airs of different densities be A and B ; if they communicate by a tube whose section is a , there will be a current from the vessel containing the denser air into that containing the rarer; it is proposed to find an expression for the time of efflux.

Let P be the elastic force of the air in the vessel A , Q its density, and V its velocity; D being the density of the air in the vessel whose capacity is B . After the time t let the density of the air in A be q , its velocity v , the density of the air in B having become δ . The force expelling from A will then

be $P - \frac{PD}{Q}$ at the first instant, and at the end of the time t it will be $\frac{Pq - P\delta}{Q}$. So that we shall have $\frac{PQ - PD}{Q} : \frac{Pq - P\delta}{Q} :: QV^2 : qv^2$; whence arises

$v = V \sqrt{\frac{Q(q - \delta)}{q(Q - D)}}$; and we see that the motion will cease when $\delta = q$.

Now the capacities of the vessels being A and B respectively, we have for a second equation, including the densities, $AQ + BD = Aq + B\delta$; from which we find $\delta = \frac{A(Q - q) + BD}{B}$. This value of δ

being substituted in the preceding value of v , transforms it to $v = V \sqrt{\frac{Q[B(q - D) - A(Q - q)]}{qB(Q - D)}}$; an equation which gives the relation between the velocity v and the density q .

In order to find the time when the air in A is reduced to the density q , it will be convenient to abridge the work by some substitutions: thus, make $Q(B + A) = M$, $BQ(D + Q) = N$, $BQ - BD = R$, and $\frac{N}{M} = m$. Then, proceeding as in the propositions immediately before this, we obtain the fluxionary equation

$$aqt \sqrt{2gH \cdot \frac{M(q - N)}{Rq}} = \text{flux. of } (AQ - Aq) = -\dot{A}q.$$

This gives $t = \frac{A\sqrt{R}}{a\sqrt{2gMH}} \times \frac{-q}{\sqrt{q^2 - mq}}$; the fluent of which, so corrected that $t = 0$ when $q = Q$, is as below:

$$t = \frac{A}{a} \times \sqrt{\frac{R}{2gMH}} \times \text{hyp. log.} \left(\frac{Q - \frac{1}{2}m + \sqrt{Q^2 - mQ}}{q - \frac{1}{2}m + \sqrt{q^2 - mq}} \right).$$

In a manner not widely different from some of the propositions in this chapter might various other problems relative to the passage of air from one vessel to another be solved: but such problems are not of very frequent use in the common applications of pneumatics to practice, and are therefore not inserted here.

For other researches, &c. connected with pneumatics, see the articles ALTITUDE, ATMOSPHERE, AIR, AIR-PUMP, PUMP, RESISTANCE, WIND, &c. See also Gregory's Mechanics, Vol. I. Book V.

PNEUMATOCELE. (*πνευματοκήλη*; from *πνευμα*, wind, and *κήλη*, a tumour.) Any species of hernia that is distended with flatus.

PNEUMATOLOGY. *s.* (*πνευματολογία*.) The doctrine of spiritual existence.

PNEUMATOPHALUS. (*πνευματοφάλος*; from *πνευμα*, wind, and *ομφαλος*, the navel.) A flatulent, umbilical hernia.

PNEUMATOSIS. (*πνευματωσις*; from *πνευματοω*, to inflate.) Emphysema, or windy swelling. A genus of disease in the class cachexiæ, and order intumescentiæ of Cullen, known by a collection of air in the cellular texture under the skin, rendering it tense, elastic, and crepi-

tating. The species of pneumatosis are: 1. Pneumatosis spontanea, without any manifest cause. 2. Pneumatosis traumatica, from a wound. 3. Pneumatosis venenata, from poisons. 4. Pneumatosis hysterica, with hysteria.

PNEUMONIA. (*πνευμονία*, from *πνευμων*, a lung.) Inflammation of the lungs. A genus of disease in the class pyrexia, and order phlegmasiæ of Cullen; characterised by pyrexia, difficult respiration, cough, and a sense of weight and pain in the thorax. The species of pneumonia, according to the above nosologist, are, 1. Peripneumonia. The pulse not always hard, but sometimes soft: an obtuse pain in the breast; the respiration always difficult; sometimes the patient cannot breathe, unless in an upright posture; the face swelled, and of a livid colour; the cough for the most part moist, frequently bloody. 2. Pleuritis. The pulse hard: a pungent pain in one side, aggravated during the time of inspiration; an uneasiness when lying on one side; a very painful cough, dry in the beginning of the disease, afterwards moist, and frequently bloody. See PLEURITIS.

With respect to pneumonia, the most general cause of this inflammation is the application of cold to the body, which gives a check to the perspiration, and determines a great flow of blood to the lungs. It attacks principally those of a robust constitution and plethoric habit, and occurs most frequently in the winter season and spring of the year; but it may arise in either of the other seasons, when there are sudden vicissitudes from heat to cold.

Other causes, such as violent exertions in singing, speaking, or playing on wind instruments, by producing an increased action of the lungs, have been known to occasion peripneumony. Those who have laboured under a former attack of this complaint are much pre-disposed to returns of it.

The true peripneumony comes on with an obtuse pain in the chest or side, great difficulty of breathing (particularly in a recumbent position, or when lying on the side affected), together with a cough, dryness of the skin, heat, anxiety, and thirst. At the first commencement of the disease the pulse is usually full, strong, hard, and frequent; but in a more advanced stage it is commonly weak, soft, and often irregular. In the beginning the cough is frequently dry and without expectoration; but in some cases it is moist even from the first, and the matter spit up is various both in colour and in consistence, and is often streaked with blood.

If relief is not afforded in time, and the inflammation proceeds with such violence as to endanger suffocation, the vessels of the neck will become turgid and swelled; the face will alter to a purple colour; an effusion of blood will take place into the cellular substance of the lungs, so as to impede the circulation through that organ, and the patient will soon be deprived of life.

If these violent symptoms do not arise, and

the proper means for carrying off the inflammation have either been neglected, or have proved ineffectual, although adopted at an early period of the disease, a suppuration may ensue, which event is to be known by frequent slight shiverings, and an abatement of the pain and sense of fulness in the part, and by the patient not being able to lie on the side which was affected, without experiencing great uneasiness.

When peripneumony proves fatal, it is generally by an effusion of blood taking place into the cellular texture of the lungs, so as to occasion suffocation, which usually happens between the third and seventh day; but it may likewise prove fatal, by terminating either in suppuration or gangrene.

When it terminates by resolution, some very evident evacuation always attends it; such as a great flow of urine, with a copious sediment, diarrhoea, a sweat diffused over the whole body, or a hemorrhage from the nose; but the evacuation which most frequently terminates the complaint, and which does it with the greatest effect, is a free and copious expectoration of thick white or yellow matter slightly streaked with blood, and by this the disease is carried off generally in the course of ten or twelve days.

Our opinion as to the event is to be drawn from the symptoms which are present. A high degree of fever, attended with delirium, great difficulty of breathing, acute pain, and dry cough, denote great danger: on the contrary, an abatement of the febrile symptoms, and of the difficulty of breathing, and pain, taking place on the coming on of a free expectoration, or the happening of any other critical evacuation, promises fair for the recovery of the patient. A termination of the inflammation in suppuration is always to be considered as dangerous.

On dissection, the lungs usually appear inflamed, and there is often found an extravasation, either of blood, or of coagulable lymph in their cellular substance. The same appearances likewise present themselves in the cavity of the thorax and within the pericardium. The pleura, connected with the lungs, is also in an inflamed state, having its surface every where crowded with red vessels. Besides these, abscesses are frequently found in the substance of the lungs, as likewise tubercles and adhesions to the ribs are formed. A quantity of purulent matter is often discovered also in the bronchiae.

PNEUMONICS, in pharmacy, medicines proper to be given in those diseases, in which respiration is affected.

PNEUMORA, in zoology, a genus of the class insecta, order hemiptera. Body ovate, inflated, diaphanous; head inflected, armed with jaws; thorax convex, carinate beneath; wing-cases deflected, membranaceous; legs formed for running. These appear to consist of a mere hollow, inflated membrane; by rubbing together their serrate, or toothed legs they make a shrill kind of noise morning and

evening, and follow a light; they are so nearly allied to the cricket-tribe, that Fabricius has enumerated them under the genus gryllus. Three species; all inhabitants of the Cape, the wing-cases green, immaculate, or spotted with white.

PO, the principal river of Italy, which has its source at Mount Viso in Piedmont, flows through Montferrat, the Milanese, and the Mantuan; thence on the borders of the Parmesan, and a part of the Modenese; and having entered the Ferrarese, it divides at Fichetulolo, and enters the gulf of Venice by four principal mouths. In its course it receives several rivers, and often overflows its banks, as most of those rivers descend from the Alps, and are increased by the melting of the snow. It gives name to a new department of France, including part of Piedmont, of which the capital is Turin.

Po, a river of China, in the province of Kiang-si, which runs into the Poyang-hou, a small distance from Jao-tcheou.

POA, Meadow-grass. In botany, a genus of the class triandria, order digynia. Calyx two-valved, many-flowered; spikelet rounded at the base; corol two-valved, the valves ovate, acuteish, awnless. Sixty-five species, scattered over the globe; of which sixteen are common to our own country: most of them forming an excellent and agreeable food for cattle. The following are the sorts chiefly cultivated:

1. *P. pratensis*. Smooth-stalked meadow-grass. Panicle diffuse; spikelets four-flowered; glumes lanceolate, five-nerved, united by hairs; stipule abbreviated, obtuse.

2. *P. trivialis*. Rough-stalked meadow-grass. Panicle diffuse; spikelets three-flowered; glumes lanceolate, five-nerved, united by fine hairs at the base; stipule elongated.

3. *P. aquatica*. Water-reed grass. Panicle erect, branched, loose; spikelets six-flowered, linear; florets obtuse, seven-nerved. The largest of the British grasses, rising in marshy soils and in waters to the height of five or six feet: most cattle are fond of it; and will often so far plunge into deep stagnant waters for it as to endanger their lives.

For the rest, see **HUSBANDRY**.

To **POACH**. *v. a.* (*oeufs poches*, French.)

1. To boil slightly (*Bacon*). 2. To begin without completing: from the practise of boiling eggs slightly (*Bacon*). 3. (*pocher*, French, to pierce.) To stab; to pierce (*Carew*). 4. (from *pocher*, Fr. a pocket.) To plunder by stealth (*Garth*).

To **POACH**. *v. n.* (from *pocher*, a bag, Fr.)

1. To steal game; to carry off game privately in a bag (*Oldham*). 2. To be damp. A cant word (*Mortimer*).

POACHER. *s.* (from *poach*.) One who steals game (*More*).

POACHINESS. *s.* Marshiness; dampness. A cant word (*Mortimer*).

POACHY. *a.* Damp; marshy (*Mortimer*).

POCHAREL, in ornithology. See **ANAS**.

POCK. *s.* (from *pox*.) A pustule raised by the smallpox.

POCKET. *s.* (pocca, Saxon; *pochet*, Fr.)

1. The small bag inserted into clothes (*Prior*).
2. A pocket is used in trade for a certain quantity: as, a *pocket* of hops.

To POCKET. *v. a.* (*pocheter*, French; from the noun.) 1. To put in the pocket (*Pope*). 2. To POCKET *up*. A proverbial form that denotes the doing or taking any thing clandestinely (*Prior*).

POCKETBOOK. *s.* (*pocket* and *book*.) A paper book carried in the pocket for hasty notes (*Watts*).

POCKETGLASS. *s.* (*pocket* and *glass*.) Portable looking-glass (*Swift*).

POCKHOLE. *s.* (*pock* and *hole*.) Pit or scar made by the smallpox (*Donne*).

POCKINESS. *s.* (from *pocky*.) The state of being pocky.

POCKLINGTON, a town in E. Yorkshire, with a market on Saturday, seated on a stream that runs into the Derwent, 14 miles E. of York, and 194 N. by W. of London.

POCKY. *a.* (from *pox*.) Infected with the pox.

POCO. (Ital.) In music, a term of diminution: as *poco largo*, rather slow, *poco piano*, a little soft.

Poco. (Ital.) Little: as *poco piu lento*, a little slower: *poco piu allegro*, a little quicker.

POCOCKE (Edward), a celebrated orientalist, born at Oxford, 1604. He was educated at Thame school, and Magdalen hall, Oxford, from which he removed to a scholarship at Corpus. Distinguished by his knowledge of classical and oriental literature, he, by the interest of Selden, obtained the place of chaplain to the English factory at Aleppo. He was in 1631 employed by Laud to make a collection of such valuable MSS. and coins as might enrich an university library; and in 1636 he was informed by that liberal patron that he was nominated to fill his newly founded Arabic professorship in Oxford. He returned in consequence from Aleppo, but afterwards went to Constantinople with Greaves, who was going to explore the antiquities of Egypt. He was invited by Laud in 1640 to return, and in his way through Paris, he became acquainted with Grotius, to whom he communicated his intention of translating his book *De veritate christ. religionis*, into Arabic, which the pious author approved. In 1643 he was presented by his college to the rectory of Childrey, Berkshire, where he retired; but he was deprived of his professorship by the republicans. He was in 1647 restored to his salary, and the next year nominated by the king, then a prisoner, professor of Hebrew and canon of Christ-church, an appointment approved by the parliament, but rescinded when he refused to subscribe to the engagement. Though deprived of his canonry, he read lectures, and in 1652 assisted in preparing the edition of the Polyglott bible. The restoration reinstated him in all his offices, but he was neglected among those who had by their services contributed most to the advancement of religion and learning in the kingdom. He died at

Oxford, 1691, aged 87, and was buried in the cathedral. As a scholar and orientalist his abilities were great. His sole ambition was the advancement of oriental literature, to which he devoted himself with assiduous care. His works are Specimen historiae Arabum, 1648, much commended by Prideaux, Ockley, Selden, Reland, and others.—Porta Mosis, or six prefatory discourses of Moses Maimonides—Eutychius' annals—Abul Feraji historia dynastarum, 4to.—Commentaries on Micah, Malachi, Hosea, and Joel, fol.—St. Peter's second epistle, the second and third of John, and that of Jude, translated into Syriac—Letters with several learned men, published by Twells, 2 vols. fol. 1740. His eldest son Edward, rector of Minal, Wilts, published an Arabic work, called Philosophus Autodidactus, sive Epistola Jaafar Ebn Tophail, &c.

POCOCKE (Richard), a divine, related distantly to the celebrated orientalist. He was born 1704, at Southampton, where his father was master of the free school, and he was educated at Corpus Christi, Oxford. He travelled into the East in 1737, and returned in 1742, and in 1744 was made precentor of Waterford. He accompanied as chaplain lord Chesterfield to Ireland, and was appointed by him archdeacon of Dublin, and under another viceroy made bishop of Ossory, 1756. In 1765 he was translated to Elphin and Meath, and died the September of that same year, of a fit of apoplexy. He published a valuable account of his travels, under the title of Observations on Egypt, Palestine, the Holy Land, Syria, Mesopotamia, Cyprus, &c. 3 vols. fol. He also enriched the British museum by the gift of various volumes of MSS.

POCULENT. *a.* (*poculum*, Latin.) Fit for drink.

POD, in botany. See SILIQUE.

PODAGRA. (ποδάγρα; from *πῶς*, the foot, and *αἶσα*, a taking or seizure.) The gout. A genus of disease in the class pyrexia, and order phlegmasia of Cullen; known by pyrexia, pain in the joints, chiefly of the great toe, and especially the hands and feet, returning at intervals: previous to the attack, the functions of the stomach are commonly disturbed. Species: 1. Podagra regularis, the regular gout. 2. Podagra atonica, the atonic gout. 3. Podagra retrograda, the retrocedent gout. 4. Podagra aberrans, misplaced or wandering gout.

PODAGRICAL. *a.* (ποδαγρικός; ποδάγρα.) 1. Afflicted with the gout (*Brown*). 2. Gouty; relating to the gout.

PODALIRIUS, a son of Æsculapius and Epione, was one of the pupils of the Centaur Chiron, under whom he made himself such a master of medicine, that, during the Trojan war, the Greeks invited him to their camp, to stop a pestilence which had baffled the skill of all their physicians. At his return, he was shipwrecked on the coast of Caria, where he fixed his habitation, and built two towns, one of which he called Syrna, from the name of his wife.

PODALYRIA, in botany, a genus of the

class decandria, order monogynia. Calyx somewhat two-lipped, five-cleft; corol papilionaceous, with the wings as long as the standard; legume inflated, many-seeded. Fifteen species; chiefly natives of the Cape.

PO'DDER. s. (from *pod.*) A gatherer of peascods, beans, and other pulse.

PODEX, in anatomy. See **ANUS**.

PODGE. s. A puddle; a plash (*Skinner*).

PODGE, in mastiology. See **DIDELPHIS**.

PODLACHIA, a province of Poland, 88 miles long and 30 broad; bounded on the N. by Prussia, E. by Lithuania, S. by the palatinate of Lublin, and W. by that of Masovia. It is also called the palatinate of Bielsk, from the capital.

PODOLIA, a province in the S.E. part of Poland, wrested from that country by the emperors of Russia, in 1793. The Dniester separates it from Moldavia on the S.W.; and the Bog crosses it from the N. in a S.E. direction. It is divided into the palatinates of Podolia and Bracklaw. Kamienieck is the capital of the former, and Bracklaw of the latter.

PODOPHYLLUM. May-apple. In botany, a genus of the class polyandria, order monogynia. Calyx three-leaved; petals nine; berry one-celled, crowned with the stigma. Two species, creeping plants of North America.

PODOR, a fortress of Africa, on the river Senegal, built by the French. It was ceded to the English in 1763, but afterward taken by the French, and confirmed to them by the peace of 1783. Lon. 14. 20 W. Lat. 17. 1 N.

PODURA. Spring-tail. In zoology, a genus of the class insecta, order aptera. Lip bifid; feelers four, subclavate; eyes two, composed of eight facets; antennae filiform; body scaly; tail forked, bent under the body, and acting as a spring; legs six, formed for running. Thirty-one species, all European insects, chiefly natives of Denmark; twelve common to our own country. They feed on the leaves of various plants; the larve and pupae are six-footed, nimble, and resemble the perfect insect. The following may serve as specimens:

1. **P. villosa.** Rough spring-tail. This is a British insect, and the largest of the tribe known to us. The ground-colour is dark brown, mixed with a shade of yellow, and variegated all over with streaks of black. The abdomen alone is smooth, the head being very much covered with hairs, which are so deciduous, that they stick to the fingers on handling the animal; the antennae consist of four articulations, and are nearly as long as the body. Found under stones.

2. **P. aquatica.** Black, aquatic. Inhabits our own country and Europe. Assembles in troops early in the morning, on the banks of pools and fishponds, appearing like scattered grains of gunpowder to a cursory view; but if closely examined will be found in an almost continual skipping motion.

3. **P. finetaria.** White, terrestrial. Inhabits Europe; found early in the spring in fresh earth.

4. **P. atra.** Frequents melon beds and hot-houses; where, on watering the ground, numbers are seen jumping into the air like atoms: they are the smallest of the *poduræ*, shining brown, and globular.

POE-BIRD, in ornithology, an inhabitant of some of the South Sea Islands, where it is held in great esteem and veneration by the natives. It goes by the name of kogo in New Zealand; but it is better known by that of poe-bird. It is somewhat less than our blackbird. The feathers are of a fine mazarine blue, except those of its neck, which are of a most beautiful silver gray, and two or three short white ones which are on the pinion-joint of the wing. Under its throat hang two little tufts of curled snow-white feathers, called its poies (the Otaheitian word for ear-rings), which occasioned the name of poe-bird being given to it. It is remarkable for the sweetness of its note, as well as the beauty of its plumage. Its flesh is also delicate food.

POECILE, a celebrated portico at Athens, which received its name from the variety of paintings which it contained. It was there that Zeno kept his school, and the stoics also received their lessons there, whence their name, *στωα*, a porch.

POEM. s. (*poema*, Latin; *ποίημα*.) The work of a poet; a metrical composition (*Ben Jonson*).

POENI, a name sometimes given to the Carthaginians.

POESTUM, or **POSIDONIA**, an ancient city of Grecia Magna, now part of the kingdom of Naples. It was founded by one of those colonies from Greece which in the early ages established themselves in Italy; and it flourished before the foundation of Rome itself. It was destroyed by the Goths on the decline of the Roman empire, who in their barbarous zeal for the Christian religion overturned every place of Pagan worship which was exposed to their ravages. Since that time it has been in ruins.

PO'ESY. s. (*poésie*, French; *poësis*, Latin; *ποίησις*.) 1. The art of writing poems (*Ben Jonson*). 2. Poem; metrical composition, poetry (*Shakspeare*). 3. A short conceit engraved on a ring or other thing (*Shakspeare*).

PO'ET. s. (*poète*, French; *poëta*, Lat. *ποιητής*.) An inventor; an author of fiction; a writer of poems; one who writes in measure (*Milton*).

POETASTER. s. (Latin.) A vile petty poet (*Ben Jonson*).

PO'ETESS. s. (from *poet*.) A she poet.

PO'ETICAL. PO'ETIC. a. (*ποιητικός*; *poétique*, Fr.; *poeticus*, Lat.) Expressed in poetry; pertaining to poetry; suitable to poetry (*Hale*).

PO'ETICALLY. ad. With the qualities of poetry; by the fiction of poetry (*Raleigh*).

To POETIZE. v. n. (*poëtiser*, French; from *poet*.) To write like a poet (*Donne*).

PO'ETRESS. s. (from *poetris*, Lat.) A she poet (*Spenser*).

PO'ETRY. s. (*ποιητική*.) 1. Metrical com-

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position; the art or practice of writing poems (*Cleaveland*). 2. Poems; poetical pieces (*Shakspeare*).

POETRY, (from the Greek *ποιητρια*, of *ποιω*, *facio*, I make,) is often defined, the art of composing poems, or pieces in verse. According to Aristotle, poetry is *τεχνη μιμητικη*, an imitative art. And Baron Bielfield, in later times, calls poetry the art of expressing our thoughts by fiction.

Neither of these definitions, however, is, in our opinion, sufficiently general. We hope to be able to furnish one that is more satisfactory, but must first present a few preliminary observations.

Poetry is the oldest, the rarest, and the most excellent of the fine arts. It was the first fixed form of language; the earliest perpetuation of thought; it existed before prose in history, before music in melody, and before painting in description. Anterior to the discovery of letters, it was employed to vent the praises of God, to communicate the lessons of wisdom, and to celebrate the achievements of valour; music was invented to accompany, and painting to illustrate it. We have said, that poetry is the *rarest* of the fine arts, and we may appeal to almost any collection of specimens of poetry in proof of our assertion. Thus Southey's Specimens exhibit pieces of more than two hundred writers, among whom there are not twenty whose compositions rise to the dignity of poetry; and of these, perhaps, not more than seven will be known to posterity by their works. The art of constructing easy, elegant, and even spirited verse, may be acquired by any mind of moderate capacity and liberal knowledge; but to frame the lay that quickens the pulse, flushes the cheek, warms the heart, and expands the soul of the reader, playing upon his passions as upon a lyre, and making him feel as if he were conversing with a spirit,—this is the *art of nature herself*, invariably and perpetually pleasing, by a secret undefinable charm, that lives through all her works, and causes the very stones to cry out—

“The hand that made us is divine.”

The power of being a poet is a power from heaven: wherein it consists we know not; but this we do know, that there never existed a poet of the highest order,—and we acknowledge none other to be truly poets,—who either learned his art of one, or taught it to another. It is true that the poet communicates to the bosom of his reader that flame that burns in his own, but the bosom thus enkindled cannot communicate the fire to a third; in the mind of the bard alone that energy of thought which gives birth to poetry is an active principle, in all others it is only a passive feeling. This theory is confirmed by the fact, that though poetical genius is wonderfully aided in its development and display, by learning and taste, yet among the rudest people it is found, like native gold and diamonds, as pure and perfect in substance, though encrusted in baser matter, as among the most enlightened nations; but it is seldomer seen, and in smaller quantities, not being laboriously dug from the mine, purified in the furnace, and polished on the wheel, but only occasionally washed from the mountains, or accidentally discovered among the sands. It is another curious fact, that with the exception of ancient Rome, the noblest works of the muse have been produced in the middle age between gross barbarism and voluptuous refinement, when the human mind yet possessed strong traits of its characteristic

grandeur and simplicity, but, divested of its native fierceness, and chastened by courtesy, felt itself rising in knowledge, worth, and intellectual superiority. The poems of Homer existed long before Greece arrived at its zenith of glory. Dante, Petrarch, and Ariosto, in Italy; Camoens, in Portugal; and Shakspeare, Spenser, and Milton, in England, flourished in ages far inferior to the present in luxury of manners, and refinement of taste: yet their poems, in the respective countries, have not since been equalled, and will probably never be surpassed by their successors.

Poetry is also the most *excellent* of the fine arts. It transcends all other literary composition in harmony, beauty, and splendour of style, imagery, and thought, as well as in the permanency and vivacity of its influence on the mind; for its language and sentiments are so intimately connected that they are remembered together: they are soul and body, that cannot be separated without death,—a death, in which the dissolution of the one causes the disappearance of the other; if the spell of the words be broken, the charm of the idea is lost.

Poetry excels music in the passion and pathos of its movements; for its cadences are ever united with distinct feelings and emotions of the soul, and their association is always clear and comprehensible; whereas music, except when it is allied with poetry, or appeals to memory, is simply a sensual and vague, though innocent, delight, conveying no improvement to the heart, and leaving no abiding impression on the mind.

Once more—Poetry is superior to painting: for poetry is progressive, painting stationary, in its powers of description. Poetry elevates the soul through every rising gradation of thought and feeling, and produces its grandest effects at the last: painting begins precisely where poetry ends, with the climax of the subject, and lets down the mind from the catastrophe, through the details of the story, imperceptibly soothing it from sublime astonishment into tranquil approbation. Poetry tells its own story; painting usually requires an interpreter. Painting is limited to a moment of time, and an eye-glance of space; but it must be confessed that it can make that moment last for years, and render that eye-glance as illustrious as the sun. Poetry is restricted neither to time nor place; resembling the sun itself, it may shine on every quarter of the globe, and endure to the end of ages.

Poetry has a fourth peculiarity, to which we have not yet alluded:—though the most beneficial to the world, it is the most unprofitable to its possessors of all the fine arts. There has scarcely been a period, or a country, in which a poet could live by his skill. It is allowed that great honours and emoluments have been bestowed on some of the tribe; but munificent patronage is yet rarer than transcendent talents:—at the court of Augustus there was only Mæcenâs, but there were many poets. Now, in all ages and nations, musicians and painters of every description have been able to get bread by their labours, and in general they have been dignified and remunerated to the extent of their merits. It must be enough to make a poor poet burst with spleen to read the lives of eminent musicians and painters, and contrast them with those of his more illustrious brethren: while the former have been courted, enriched, and ennobled, by pontiffs and princes, the latter have languished in poverty, and died in despair. Will any man deny that the poems of Milton, as works

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of genius, are equal to the pictures of Rubens? Yet the painter's pencil supported him in princely magnificence; the poet's muse could not procure, what even his enemies would have furnished to him gratuitously in a dungeon—bread and water. Poets might be permitted to say, that painting and music may be appreciated in this world, and recompensed by the kings of it; but poetry cannot: its "price is above rubies," and its honours are those which kings cannot confer. (*Eclectic Rev.* iii. 847.)

It is the fate of those maxims which have been thrown out by very eminent writers to be received implicitly by most of their followers, and to be repeated a thousand times, for no other reason than because they once dropped from the pen of a superior genius: one of these is the assertion of Aristotle that "all poetry consists in imitation;" which has been so frequently echoed from author to author, that it would seem a kind of arrogance to controvert it; for almost all the philosophers and critics, who have written upon the subject of poetry, music, and painting, how little soever they may agree in some points, seem of one mind in considering them as arts merely imitative. Yet it must be clear to any one who examines what passes in his own mind, that he is affected by the finest poems, pieces of music, and pictures, upon a principle which, whatever it be, is entirely distinct from imitation. M. le Batteux has attempted to prove that all the fine arts have a relation to this common principle of imitating: but, whatever be said of painting, it is probable that poetry and music had a noble origin; and, if the first language of man was not both poetical and musical, it is certain, at least, that in countries where no kind of imitation seems to be much admired, there are poets and musicians both by nature and by art: as in some Mahometan nations; where sculpture and painting are forbidden by the laws, where dramatic poetry of every sort is wholly unknown, yet where the pleasing arts of expressing the passions in verse, and of enforcing that expression by melody, are cultivated to a degree of enthusiasm. It shall be our endeavour in this article to prove, that though poetry and music have certainly a power of imitating the manners of men, and several objects in nature, yet that their greatest effect is not produced by imitation, but by a very different principle; which must be sought for in the deepest recesses of the human mind.

To state the question properly, we must have a clear notion of what we mean by poetry and music: but we cannot give a precise definition of them till we have made a few previous remarks on their origin, their relation to each other, and their difference.

It seems probable, then, that poetry was originally no more than a strong and animated expression of the human passions, of joy and grief, love and hate, admiration and anger, sometimes pure and unmixed, sometimes variously modified and combined: for if we observe the voice and accents of a person affected by any of the violent passions, we shall perceive something in them very nearly approaching to cadence and measure; which is remarkably the case in the language of a vehement orator, whose talent is chiefly conversant about praise or censure; and we may collect from several passages in Tully, that the fine speakers of old Greece and Rome had a sort of rhythm in their sentences, less regular, but not less melodious, than that of the poets.

If this idea be just, one would suppose that the

most ancient sort of poetry consisted in praising the Deity; for if we conceive a being, created with all his faculties and senses, endued with speech and reason, to open his eyes in a most delightful plain, to view for the first time the serenity of the sky, the splendour of the sun, the verdure of the fields and woods, the glowing colours of the flowers, we can hardly believe it possible that he should refrain from bursting into an ecstasy of joy, and pouring his praises to the Creator of those wonders, and the Author of his happiness. This kind of poetry is used in all nations; but as it is the sublimest of all, when it is applied to its true object, so it has often been perverted to impious purposes by pagans and idolaters. Every one knows that the dramatic poetry of the Europeans took its rise from the same spring, and was no more at first than a song in praise of Bacchus; so that the only species of poetical composition (if we except the epic) which can in any sense be called imitative, was deduced from a natural emotion of the mind, in which imitation could not be at all concerned.

The next source of poetry was, probably, love, or the mutual inclination which naturally subsists between the sexes, and is founded upon personal beauty: hence arose the most agreeable odes, and love-songs, which we admire in the works of the ancient lyric poets, not filled, like our sonnets and madrigals, with the insipid babble of darts and Cupids, but simple, tender, natural; and consisting of such unaffected endearments, and mild complaints,

Teneri sdegni, e plaiede e tranquille
Repulse, e cari vezzi, e liete paci,

as we may suppose to have passed between the first lovers in a state of innocence, before the refinements of society, and the restraints which they introduced, had made the passion of love so fierce and impetuous, as it is said to have been in Dido, and certainly was in Sappho, if we may take her own word for it.

The grief which the first inhabitants of the earth must have felt at the death of their dearest friends and relations gave rise to another species of poetry, which originally, perhaps, consisted of short dirges, and was afterwards lengthened into elegies.

As soon as vice began to prevail in the world, it was natural for the wise and virtuous to express their detestation of it in the strongest manner, and to show their resentment against the corrupters of mankind: hence moral poetry was derived, which, at first, we find was severe and passionate; but was gradually melted down into cool precepts of morality, or exhortations to virtue: we may reasonably conjecture that epic poetry had the same origin, and that the examples of heroes and kings were introduced to illustrate some moral truth, by showing the loveliness and advantages of virtue, or the many misfortunes that flow from vice.

Where there is vice, which is detestable in itself, there must be hate, since "the strongest antipathy in nature," as Mr. Pope asserted in his writings, and proved by his whole life, "subsists between the good and the bad:" now this passion was the source of that poetry which we call satire, very improperly and corruptly, since the satire of the Romans was no more than a moral piece, which they entitled *Satura* or *Satyra*, intimating, that the poem, like "a dish of fruit and corn offered to Ceres," contained a variety and plenty of

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fancies and figures; whereas the true invectives of the ancients were called lambi, of which we have several examples in Catullus, and in the Epodes of Horace, who imitated the very measures and manner of Archilochus.

These are the principal sources of poetry; and of music also, as it shall be our endeavour to show: but it is first necessary to say a few words on the nature of sound; a very copious subject, which would require a long dissertation to be accurately discussed. Without entering into a discourse on the vibrations of chords, or the undulations of the air, it will be sufficient for our purpose to observe, that there is a great difference between a common sound and a musical sound, which consists chiefly in this, that the former is simple and entire in itself like a point, while the latter is always accompanied with other sounds, without ceasing to be one; like a circle, which is an entire figure, though it is generated by a multitude of points flowing, at equal distances, round a common centre. These accessory sounds, which are caused by the aliquots of a sonorous body vibrating at once, are called harmonics, and the whole system of modern harmony depends upon them; though it were easy to prove that the system is unnatural, and only made tolerable to the ear by habit: for whenever we strike the perfect accord on a harpsichord or an organ, the harmonics of the third and fifth have also their own harmonics, which are dissonant from the principal note: these horrid dissonances are, indeed, almost overpowered by the natural harmonics of the principal chord, but that does not prove them agreeable. Since nature has given us a delightful harmony of her own, why should we destroy it by the addition of art? It is like thinking

——— to paint the lily,
And add a perfume to the violet.

Now let us conceive that some vehement passion is expressed in strong words, exactly measured, and pronounced, in a common voice, in just cadence, and with proper accents, such an expression of the passion will be genuine poetry; and the famous ode of Sappho is allowed to be so in the strictest sense; but if the same ode, with all its natural accents, were expressed in a musical voice, (that is, in sounds accompanied with their harmonics) if it were sung in due time and measure, in a simple and pleasing tune, that added force to the words without stifling them, it would then be pure and original music; not merely soothing to the ear, but affecting to the heart; not an imitation of nature, but the voice of nature herself. But there is another point in which music must resemble poetry, or it will lose a considerable part of its effect: we all must have observed, that a speaker, agitated with passion, or an actor, who is indeed strictly an imitator, are perpetually changing the tone and pitch of their voice, as the sense of their words varies: it may be worth while to examine how this variation is expressed in music. Every body knows that the musical scale consists of seven notes, above which we find a succession of similar sounds repeated in the same order, and above that other successions, as far as they can be continued by the human voice, or distinguished by the human ear: now each of these seven sounds has no more meaning, when it is heard separately, than a single letter of the alphabet would have: and it is only by their succession, and their relation to one principal sound, that they take any rank in the scale; or differ from each other, except as they are

graver or more acute: but in the regular scale each interval assumes a proper character, and every note stands related to the first or principal one by various proportions. Now a series of sounds relating to one leading note is called a mode, or a tone, and as there are twelve semitones in the scale, each of which may be made in its turn the leader of a mode, it follows that there are twelve modes; and each of them has a peculiar character, arising from the position of the model note, and from some minute difference in the ratios, as of 81 to 80, or a comma; for there are some intervals which cannot easily be rendered on our instruments, yet have a surprising effect in modulation, or in the transitions from one mode to another.

The modes of the ancients are said to have had a wonderful effect over the mind; and Plato, who permits the Dorian in his imaginary republic, on account of its calmness and gravity, excludes the Lydian, because of its languid, tender, and effeminate character: not that any series of mere sounds has a power of raising or soothing the passions, but each of these modes was appropriated to a particular kind of poetry, and a particular instrument; and the chief of them, as the Dorian, Phrygian, Lydian, Ionian, Eolian, Locrian, belonging originally to the nations from which they took their names: thus the Phrygian mode, which was ardent and impetuous, was usually accompanied with trumpets, and the Mixolydian, which, if we believe Aristoxenus, was invented by Sappho, was probably confined to the pathetic and tragic style: that these modes had a relation to poetry, as well as to music, appears from a fragment of Lasus, in which he says, "I sing of Ceres, and her daughter Melibœa, the consort of Pluto, in the Eolian mode, full of gravity;" and Pindar calls one of his Odes an Eolian song. If the Greeks surpassed us in the strength of their modulations, we have an advantage over them in our minor scale, which supplies us with twelve new modes, where the two semitones are removed from their natural position between the third and fourth, the seventh and eighth notes, and placed between the second and third, the fifth and sixth; this change of the semitones, by giving a minor third to the model note, softens the general expression of the mode, and adapts it admirably to subjects of grief and affliction: the minor mode of D is tender; that of C, with three flats plaintive, and that of F, with four, pathetic and mournful to the highest degree, for which reason it was chosen by the excellent Pergolesi in his Stabat Mater. Now these twenty-four modes, artfully interwoven, and changed as often as the sentiment changes, may, it is evident, express all the variations in the voice of a speaker, and give an additional beauty to the accents of a poet. Consistently with the foregoing principles, we may define original and native poetry to be the language of the violent passions, expressed in exact measure, with strong accents and significant words; and true music to be no more than poetry, delivered in a succession of harmonious sounds, so disposed as to please the ear. It is in this view only that we must consider the music of the ancient Greeks, or attempt to account for its amazing effects, which we find related by the gravest historians and philosophers: it was wholly passionate or descriptive, and so closely united to poetry, that it never obstructed, but always increased its influence; whereas our boasted harmony, with all its fine accords and numerous parts, paints nothing, expresses nothing,

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says nothing to the heart, and consequently can only give more or less pleasure to one of our senses; and no reasonable man will seriously prefer a transitory pleasure, which must soon end in satiety, or even in disgust, to a delight of the soul, arising from sympathy, and founded on the natural passions, always lively, always interesting, always transporting. The old divisions of music into celestial and earthly, divine and human, active and contemplative, intellectual and oratorical, were founded rather upon metaphors, and chimerical analogies, than upon any real distinctions in nature; but the want of making a distinction between music of mere sounds, and the music of the passions, has been the perpetual source of confusion and contradictions both among the ancients and the moderns: nothing can be more opposite in many points than the systems of Rameau and Tartini, one of whom asserts that melody springs from harmony, and the other deduces harmony from melody; and both are in the right, if the first speaks only of that music which took its rise from "the multiplicity of sounds heard at once in the sonorous body," and the second, of that which rose from "the accents and inflexions of the human voice, animated by the passions:"—"to decide," as Rousseau says, "whether of these two schools ought to have the preference, we need only ask a plain question, Was the voice made for the instruments, or the instruments for the voice?"

In defining what true poetry ought to be, according to our principles, we have described what it really was among the Hebrews, the Greeks and Romans, the Arabs and Persians. The lamentation of David, and his sacred odes or psalms, the song of Solomon, the prophecies of Isaiah, Jeremiah, and the other inspired writers, are truly and strictly poetical; but what did David or Solomon imitate in their divine poems? A man, who is really joyful or afflicted, cannot be said to imitate joy or affliction. The lyric verses of Alcæus, Aleman, and Ibycus, the hymns of Callimachus, the elegy of Moschus on the death of Bion, are all beautiful pieces of poetry; yet Alcæus was no imitator of love, Callimachus was no imitator of religious awe and admiration, Moschus was no imitator of grief at the loss of an amiable friend. Aristotle himself wrote a very poetical elegy on the death of a man whom he had loved; but it would be difficult to say what he imitated in it: "O Virtue! who proposest many labours to the human race, and art still the alluring object of our life; for thy charms, O beautiful goddess! it was always an envied happiness in Greece even to die, and to suffer the most painful, the most afflicting evils: such are the immortal fruits which thou raisest in our minds; fruits more precious than gold, more sweet than the love of parents and soft repose; for thee Hercules the son of Jove, and the twins of Leda, sustained many labours, and by their illustrious actions sought thy favour; for love of thee, Achilles and Ajax descended to the mansion of Pluto; and, through a zeal for thy charms, the Prince of Atarnea also was deprived of the sun's light: therefore shall the Muses, daughters of Memory, render him immortal for his glorious deeds, whenever they sing the god of hospitality, and the honours due to a lasting friendship."

In sir W. Jones's collection of poems there are some Eastern fables, some odes, a panegyric, and an elegy; yet it does not appear to us that there is the least imitation in either of them: Petrarch was certainly too deeply affected with real grief,

and the Persian poet was too sincere a lover, to imitate the passions of others. As to the rest, a fable in verse is no more an imitation than a fable in prose; and if every poetical narrative, which describes the manners, and relates the adventures of men, be called imitative, every romance, and even every history, must be called so likewise; since many poems are only romances, or parts of history, told in regular measure.

What has been said of poetry may with equal force be applied to music, which is poetry dressed to advantage; and even to painting, many sorts of which are poems to the eye, as all poems, merely descriptive, are pictures to the ear: and this way of considering them will set the refinements of modern artists in their true light; for the passions, which were given by nature, never spoke in an unnatural form, and no man, truly affected with love or grief, ever expressed the one in an acrostic, or the other in a fugue: these remains, therefore, of the false taste which prevailed in the dark ages, should be banished from this, which is enlightened with a just one.

It is true, that some kinds of painting are strictly imitative, as that which is solely intended to represent the human figure and countenance; but it will be found, that those pictures have always the greatest effect which represent some passion, as the martyrdom of St. Agnes by Domenichino, and the various representations of the Crucifixion by the finest masters of Italy; and there can be no doubt, but that the famous sacrifice of Iphigenia by Timanthes was affecting to the highest degree; which proves, not that painting cannot be said to imitate, but that its most powerful influence over the mind arises, like that of the other arts, from sympathy.

It is asserted also that descriptive poetry, and descriptive music, as they are called, are strict imitations; but, not to insist that mere description is the meanest part of both arts, if indeed it belongs to them at all, it is clear that words and sounds have no kind of resemblance to visible objects: and what is an imitation, but a resemblance of some other thing? Besides, no unprejudiced hearer will say that he finds the smallest traces of imitation in the numerous fugues, counterfugues, and divisions, which rather disgrace than adorn the modern music: even sounds themselves are imperfectly imitated by harmony, and, if we sometimes hear the murmuring of a brook, or the chirping of birds in a concert, we are generally apprised beforehand of the passages where we may expect them. Some eminent musicians, indeed, have been absurd enough to think of imitating laughter and other noises; but, if they had succeeded, they could not have made amends for their want of taste in attempting it; for such ridiculous imitations must necessarily destroy the spirit and dignity of the finest poems, which they ought to illustrate by a graceful and natural melody. It seems to me, that as those parts of poetry, music, and painting, which relate to the passions, affect by sympathy; so those, which are merely descriptive, act by a kind of substitution; that is, by raising in our minds affections, or sentiments, analogous to those which arise in us when the respective objects in nature are presented to our senses. Let us suppose that a poet, a musician, and a painter, are striving to give their friend, or patron, a pleasure similar to that which he feels at the sight of a beautiful prospect. The first will form an agreeable assemblage of lively images, which he will express in smooth and elegant

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verses of a sprightly measure; he will describe the most delightful objects, and will add to the graces of his description a certain delicacy of sentiment, and a spirit of cheerfulness. The musician, who undertakes to set the words of the poet, will select some mode which, on his violin, has the character of mirth and gaiety, as the Eolian, or E flat, which he will change as the sentiment is varied: he will express the words in a simple and agreeable melody, which will not disguise, but embellish them, without aiming at any fugue, or figured harmony: he will use the bass, to mark the modulation more strongly, especially in the changes; and he will place the tenor generally in unison with the bass, to prevent too great a distance between the parts: in the symphony he will, above all things, avoid a double melody, and will apply his variations only to some accessory ideas, which the principal part, that is, the voice, could not easily express: he will not make a number of useless repetitions, because the passions only repeat the same expressions, and dwell upon the same sentiments, while description can only represent a single object by a single sentence. The painter will describe all visible objects more exactly than his rivals, but he will fall short of the other artists in a very material circumstance; namely, that his pencil, which may, indeed, express a simple passion, cannot paint a thought, or draw the shades of sentiment: he will, however, finish his landscape with grace and elegance; his colours will be rich and glowing; his perspective striking; and his figures will be disposed with an agreeable variety, but not with confusion: above all, he will diffuse over his whole piece such a spirit of liveliness and festivity, that the beholder shall be seized with a kind of rapturous delight, and, for a moment, mistake art for nature.

Thus will each artist gain his end, not by imitating the works of nature, but by assuming her power, and causing the same effect upon the imagination which her charms produce to the senses: this must be the chief object of a poet, a musician, and a painter, who know that great effects are not produced by minute details, but by the general spirit of the whole piece, and that a gaudy composition may strike the mind for a short time, but that the beauties of simplicity are both more delightful, and more permanent.

As the passions are differently modified in different men, and as even the various objects in nature affect our minds in various degrees, it is obvious, that there must be a great diversity in the pleasure which we receive from the fine arts, whether that pleasure arises from sympathy or substitution; and that it were a wild notion in artists to think of pleasing every reader, hearer, or beholder; since every man has a particular set of objects, and a particular inclination, which direct him in the choice of his pleasures, and induce him to consider the productions, both of nature and of art, as more or less elegant, in proportion as they give him a greater or smaller degree of delight: this does not at all contradict the opinion of many able writers, that "there is one uniform standard of taste;" since the passions, and, consequently, sympathy, are generally the same in all men, till they are weakened by age, infirmity, or other causes.

If the arguments used in this essay have any weight, it will appear that the finest parts of poetry, music, and painting, are expressive of the passions, and operate on our minds by sympathy; that the inferior parts of them are descriptive of

natural objects, and affect us chiefly by substitution; that the expressions of love, pity, desire, and the tender passions, as well as the descriptions of objects that delight the senses, produce in the arts what we call the beautiful; but that hate, anger, fear, and the terrible passions, as well as objects, which are unpleasant to the senses, are productive of the sublime, when they are aptly expressed or described.

We cannot enlarge here upon the various kinds of oriental poetry: nor can we treat with all the fulness we could wish upon the subject of Greek and Latin, or as they are usually termed, classical poetry. Yet we must remark briefly that while the gems of genius are scattered through oriental compositions with wild luxuriance, they appear in classical poetry displayed in full perfection and beauty. To what causes the pre-eminence of ancient Greece in this part of literature is to be attributed, it would here be futile to conjecture. From the susceptibility of his language, the poet was enabled to exhibit the same idea under a new aspect, and to give to every fluctuation of feeling a permanent expression. If the vivacity of his descriptions fascinated the imagination, his numbers dwelt with no less enchantment on the ear. The length and shortness of syllables in the Greek and Roman languages which constituted their quantities, was determined by rules no less accurate than the notes in music; and on the proper distribution and adjustment of these quantities, the harmony of their metre depended. A stated interval of time was allowed to the pronunciation of every verse. To facilitate the labour of composition, artificial combinations of syllables by the name of feet were invented; and by the number of these, and the quantities included in them, the character of the verse was ascertained.

To these combinations various names were given; the most important were the spondee, composed of two long syllables, and the dactyl, formed by one long and two short syllables. These were solely employed in the construction of the hexameter verse, of which an imitation has been vainly attempted in the English language. The pronunciation of the Greek and Latin languages is, indeed, almost as totally lost to us, as that of the Hebrew; but such is the exquisite mechanism of their metre, that their verses cannot be read without producing a rich and often a melodious intonation, perceptible even to the unlettered ear.

In the happy regions of Greece, it is uncertain what species of poetry was first cultivated. Fables were compositions of great antiquity; the ode formed a part of religious worship; the pastoral must have been introduced in an age sufficiently refined to relish simplicity. The immortal poems of Homer were composed at an early epoch of Grecian literature, and, as is well known, transmitted by oral tradition to a more polished age. Of this extraordinary man so much has been said, that it would appear difficult to say any thing which should not now be trivial or impertinent. This arduous task the perseverance of modern criticism has, however, achieved; and a scholastic sect is now known to exist who would sacrilegiously remove the shrine of Homer from the temple of fame, and abandon to superstitious credulity a name sanctified by the enthusiasm and veneration of preceding ages.

It is pretended that the Iliad and Odyssey were composed at different eras, by various authors; and that these desultory tales of Troy were

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at length collocated and edited by some ingenious critic, who might possibly have been distinguished by the appellation of Homer. The novelty, and, perhaps, the extravagance of this hypothesis, have obtained for it partisans among those professed sceptics and segregatists who can perceive no difference between vulgar errors and popular opinions, and whose ambition it is to recede as far as possible from all participation in the sentiments or convictions of other men. It is generally admitted that the excellence in which the supposed Homer stands unrivalled, is the energy of his conceptions, which gives to his personages, his scenes, and his descriptions, a real and individual existence. With such felicity are his characters cast, that no reader of feeling can be at a loss to conceive how Achilles would look, or Nestor speak, or Ulysses act, on any imaginary occasion. The unprejudiced will decide whether such exquisite harmony of design could have been the result of chance, or whether each book had its separate Homer, or whether they were all planned and executed by one.

In lyrical composition, the most popular was the heroic ode. The name of Pindar has descended to us with honour; but the poems which inspired in his compatriots the most exalted enthusiasm are but imperfectly understood by the student, and are almost impracticable to translation. The public recitation of the ode was accompanied both by music and dancing: a circumstance to which its structure was obviously adapted. The two first stanzas, called the strophe and the antistrophe, were of equal length. In the first part the performers approached the altars of their god; in the latter, the dance being inverted, they measured back their steps to their former place, where whilst they sung the epode they stood still. It appears that this form was peculiar to the heroic ode. There were other lyrical compositions of a different cast. Sappho's poems breathe only tender, impassioned sentiment; those of Anacreon, whether amatory or convivial, are equally remote from the sublimity of Pindar, and the melting softness of Sappho. The fervid imagination of Pindar is compared by Horace to the impetuosity of a mountain torrent:

Monte decurrens velut amnis, imbres
Quem super notas aluere ripas,
Fervet, immensusque ruit profundo
Pindarus ore;

Pindar, like some fierce torrent swoln with showers,
Or sudden cataracts of melting snow,
Which from the Alps its headlong deluge pours,
And foams and thunders o'er the vales below,
With desultory fury borne along,
Rolls his impetuous, vast, unfathomable song.

WEST.

The heroic ode is evidently of a dramatic character, and was the primitive source from whence the regular drama was produced. Tragedy originated in the hymns sung in honour of Bacchus; and its name was derived from the goat, which was the victim consecrated to that deity. The invention of dialogue and action belongs to Eschylus; the original ode was preserved in the chorus, which constituted the popular part of the entertainment. The chorus, like the band of a modern orchestra, was composed of several persons who recited in a different manner from the other performers. We learn from Horace that their business was to deduce from the passing scene some lesson of morality, or to inculcate on the spectator some religious precept. The intervention of the

chorus, which is now rejected by the most zealous votaries of Greece, is not more repugnant to our ideas of propriety than many other usages of the ancient stage: the performers appeared in masks; in their recitations they were constantly accompanied by musical instruments, by which the voice was sustained, and the melody of the verse rendered sensible to an immense audience. The rules of the ancient drama were suited to its institution. The unities of time and place were necessary in a performance to which the auxiliary resources of modern machinery were wanting, and from which all the magical illusions of the modern scene were precluded. The tragedies of Euripides and Sophocles were masterpieces in their kind, but would now probably be little relished even by scholars and scholastic enthusiasts.

Comedy, like tragedy, originally consisted of a chorus, which derived its name from the god Comus. The rudiments of the comic art may, perhaps, be detected in the satyrs, a sort of interlude annexed to tragedies, in which the scene was rural, and the personages Satyrs, or sylvan deities. In the plays of Aristophanes, living characters were introduced, and Socrates beheld himself ridiculed on the stage. This abuse a better taste corrected; and the comedies of Menander, which were imitated by Terence, exhibited only interesting pictures of domestic life. The chorus at first appendant on comedy, was gradually changed into the prologue, a personage who carefully apprized the spectators of all they were to see on the stage.

The Roman writers were modelled on those of Greece, and it was long before they attempted to emulate their masters; yet Ennius, one of their elder poets, produced the satire, a species of miscellaneous poetry purely Roman, which was destined to receive perfection from Horace. With equal originality, Lucretius wrote his metaphysical systems of his age; but it was not till the era of Augustus that the bards of Latium established their equality with those of Greece. It was then that Horace, not satisfied with having transplanted all the lyric beauties to his odes, opened a rich vein of satiric poetry; and Virgil, having equalled Theocritus, without temerity aspired to emulate Homer. In the *Æneid* it may be acknowledged that he sometimes fell short of his master. His characters possess not the same features, durability and grandeur; nor are his scenes equally animated and dramatic. To atone for these defects, he unites every charm that gives interest to narrative or lends enchantment to description; occasionally he rises to the sublime, but the beautiful is his natural element; he can excite terror, but he is more prone to inspire tenderness and pity. In the delicate touches of nature and pathos, he seems to have grown enamoured of his subject, and to have lingered affectionately on the endearing scenes and charities of domestic life. The four first books of the *Æneid* contain a tale so sweetly told, that was it transferred to a rude language, totally unsusceptible of its literary graces, it would still be read and remembered by all who had capacities for sympathy and tenderness.

In the *Georgics*, Virgil has left a model of didactic composition, enabled by a strain of philosophical sentiment, pure, graceful, and persuasive. Ovid, whose talents were not less versatile than those of his contemporaries, adorned the fables of mythology with description, and illustrated in his epistles almost every romantic story of antiquity. The style of his elegies is not un-

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like that of his epistles: he paints to the eye, but he has often too much wit and fancy to touch the heart.

Tibullus has exceeded every other elegiac writer in simplicity and tenderness. Lucan and Statius were also epic poets, but they are seldom quoted, and not often read. Lucan possessed a genius of an exalted order; but his subject was peculiarly unfortunate, and his beauties are now neglected because they are found in scenes repulsive to the imagination, and uncongenial with the feelings.

Among the last poets of Rome, appeared Juvenal and Persius, of whom the former was one of the most original writers she had produced. He professes to exhibit a picture of his times; and there is in his manner an undissembled and almost a holy fervour that atones for his occasional ruggedness and asperity.

Origin of modern poetry.—The Gothic nations who over-ran Rome, though ignorant of the polite arts, were not insensible to the charms of poetry. Their bards were no less venerated than their priests; and whatever instruction they received, whatever knowledge they possessed, was communicated in metre, and probably in rhyme.

In the age of Charlemagne, the minstrels of Provence, or, as they were called, the troubadours, introduced the metrical tales or ballads, which, from the dialect in which they were written, acquired the name of romances. Their poems were all composed in rhyme; but whether this practice was borrowed from the Arabs or the Goths is uncertain. The Italian language, which of all the corrupt dialects introduced by the barbarians, assimilated most with the Roman, soon acquired a tincture of elegance. In the middle ages Dante wrote; Ariosto followed; and Petrarch, the enthusiastic votary of classical genius, appeared among the first founders of modern literature. The passion for allegory, so long the characteristic of the Italian school, was by Chaucer rendered as prevalent in England as it had previously been on the continent. During several ages, Italy continued to be the Poets' Land of Europe; and in that interval was produced the Jerusalem Delivered, a poem not unworthy of a Roman bard, or an Augustan age.

In Spain, poetry was early cultivated, but with little attention to classical taste. In France, it emerged not from barbarism till the reign of Francis the First, and arrived at its ultimate point of perfection in the era of Louis the Fourteenth. La Fontaine and Boileau, Corneille and Racine, had then lived, and produced works destined to immortalize their names. Unfortunately for French poets, criticism was then almost coeval with poetry; and a pedantic attention to rules was soon permitted to repress the native energies of genius. The modern drama, it is well known, originated in the mysteries; a sort of religious farce, imported from the East. To the mysteries succeeded allegorical plays, called moralities: these produced the mask, which became the favourite amusement of the court in the time of Charles the First, and is redeemed from opprobrium and oblivion by Milton's *Comus*. Gondibert, written by lord Sackville, was the first tragedy represented on an English stage. Till the commencement of the eighteenth century, the German language was almost a stranger to poetry. Klopstock invented hexameter verse, in which the mechanism of classical numbers is rather perceived than felt by the reader. From that era, Germany has been more productive of books than

all the rest of Europe; and during this period, many fine writers have arisen of real and original genius: but the literary commerce of the country is chiefly supported by translation; the Germans having arrived at no less distinction as the general translators, than did their neighbours the Dutch as the carriers, of Europe.

Of English versification.—In the English language, versification depends not on the quantities, or the length and shortness of the syllables: but on the modulation of the accents, and the disposition of the pauses; to which is generally added the recurrence of rhyme. The heroic verse consists of ten syllables; its harmony is produced by a certain proportionate distribution of accented and unaccented syllables; and its specific character, whether lively or solemn, soft or slow, is determined by their order and arrangement. When unaccented and accented syllables are regularly alternated, it is called the iambic verse; as,

"A shepherd's boy, he seeks no higher name, |
Led forth his flock beside the silver Thame."

When this order is inverted, and the unaccented is preceded by the accented syllable, it is called a trochaic verse; as,

"Ambition first sprung from the bléss abode." |
"Take, holy earth, all that my soul holds dear."

The frequent intervention of the trochaic is apt to produce harshness. The monotony which it might be expected should result from a succession of iambic lines, is obviated by the freedom with which the pause is transferred from one syllable to another; a freedom which constitutes the charm, and produces all the variety, of English verse. The pause or cesura is that interval of suspension which must naturally arise in every verse, the position of which the English poet is allowed to change and diversify at pleasure. When the pause falls on the fourth syllable, the strain is smooth and airy; as,

"Soft is the strain | when Zephyr gently blows,
And the smooth stream | in smoother number flows."

When it falls on the second it is commonly accelerated; as,

"Not so | when swift Camilla scours the plain."

Occasionally the pause dwells on the first, second, or penultimate syllable:

"O friend! | may each domestic bliss be thine:
Be no unpleasing melancholy | mine.
Me | let the tender office long engage,
To rock the cradle of declining age."

A second pause is sometimes happily introduced:

"O ever beauteous | ever lovely | tell,
Is it in heaven a crime to love too well?"

In the following examples, the first passage has all the spirit and energy of the ode; the second, the slow and plaintive melody of the elegiac strain:

"Come then, my friend, my genius, come along,
O master of the poet and the song!
And while the muse now stoops, | and now ascends,
To man's low passions, | or their glorious ends,
Teach me, like thee, | in various nature wise,
To fall with dignity, | with temper rise;
Form'd by thy converse, | happily to steer
From grave to gay, | from lively to severe;

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Correct with spirit, | eloquent with ease,
Intent to reason, | or polite to please."

"In these deep solitudes, | and awful cells,
Where heavenly pensive contemplation | dwells,
And ever-musing melancholy reigns."

The heroic verse is often diversified by the intervention of an Alexandrine line of twelve syllables, which is liberally used by Dryden: its abuse is pointedly censured by Pope;

"A needless Alexandrine ends the song,
Which, like a wounded snake, drags its slow
length along."

It forms a noble termination:

"Teach me to love and to forgive;
Exact my own defects to scan,
What others are to feel, and know myself a
man."

Triplets often occur in heroic verse; a practice to which Dryden was strongly addicted, but which is now generally avoided by correct writers.

The stanza of nine lines, in imitation of the Italian, was introduced by Spenser. Of this verse, which, if not impracticable, was at least repugnant, to the English language, the following extract is a favourable specimen:

"A gentle knight was pricking on the plaine,
Yclad in mightie arms, and silver shield,
Wherein old dintes of deep woundes did remain,
The cruel marks of many a bloody field;
Yet armes till that time did he never wield.
His angry steed did chide his foaming bitt,
As much disdainig to the curb to yield:
A jolly knight he seem'd, and faire did sit,
As one for knightly guests and fierce encounters
fitt."

A stanza more polished in its structure is adopted by Mr. Sotheby in his admirable translation of Wieland's *Oberon*. The following passage describes Rezia's first interview with the Hermit:

"Rezia, at once entranced in holy bliss,
Aw'd by his look, that beams celestial grace,
Bows as before the genius of the place,
And prints his wrinkled hand with pious kiss.
Touched by his gracious mien or friendly air,
His beard that swept his breast with silver hair,
Her soul this stranger as her sire reveres;
A second look has banish'd all her fears:
Each reads the other's heart, nor finds a stranger
there."

The most popular stanza is that appropriate to the ballad, which is composed of four lines with interchanging rhymes. Such is the measure of Goldsmith's beautiful tale of *Edwin and Angelina*:

"Turn, gentle hermit of the dale,
And guide my lonely way,
To where yon taper cheers the vale
With hospitable ray."

And such, with the remission of rhyme in the first and third lines, is the measure of Chevy Chase:

"God save the king, and bless the land,
In plenty, joy, and peace;
And grant henceforth that foul debate
'Twixt noblemen may cease!"

The elegiac stanza consists of four alternately responsive lines of ten syllables each: it is well adapted to short poems; but in compositions of any length, its slow monotonous cadence becomes oppressive to the ear. In the celebrated elegy of

Gray, its defects, however, are all concealed by a profusion of poetical beauties; and by the graceful muse of Hammond its fetters are rendered elegant and ornamental:

"Why should the lover quit his pleasing home,
In search of danger on some foreign ground?
Or from his weeping fair ungrateful roam,
And risk in every stroke a double wound?
Ah! better far, beneath the spreading shade,
With cheerful friends to drain the sprightly bowl,
To sing the beauties of my darling maid,
And on the sweet idea feast my soul."

The common anapestic verse, of eleven and twelve syllables, in which the accent falls on every third syllable, has generally been appropriated to humorous subjects: when formed into the stanza, it assumes a different character. In the noble war-song of Burns it is however a strain truly sublime; and in the following passage of Beattie flows with equal sweetness and pathos:

"'Tis night, and the landscape is lovely no
more:

I mourn, but, ye woodlands, I mourn not for you;
For morn is approaching, your charms to restore,
Perfum'd with fresh fragrance, and glittering with
dew.

Nor yet for the ravage of winter I mourn;
Kind nature the embryo blossom will save:
But when shall spring visit the mouldering urn?
Oh! when shall it dawn on the night of the
grave?"

This stanza is, from the intractable nature of the anapestic measure, of difficult execution. In that employed by Cowper in the following instance, constructed on similar principles, the syllables are less numerous, and the cadence is in general more harmonious:

"I am monarch of all I survey,
My right there is none to dispute;
From the centre, all round to the sea,
I am lord of the fowl and the brute.
O Solitude! where are the charms
That sages have seen in thy face?
Better dwell in the midst of alarms
Than reign in this desolate place."

The occurrence of double rhymes is neither very frequent nor very easy in English verse; they are chiefly employed in songs, and are seldom admitted in the higher order of lyrical composition. The following passage from Dryden's ode on *St. Cecilia's day* affords the most happy example of this kind of verse in our language:

"Softly sweet in Lydian measures,
Soon he sooth'd his soul to pleasures;
War, he sung, is toil and trouble,
Honour but an empty bubble;
Never ending, still beginning,
Fighting still and still destroying:
If the world be worth thy winning,
Think, oh! think it worth enjoying."

The simplest and most fluent of all verse is the couplet of eight syllables. In this measure Milton has written his two exquisite poems, the *Allegro* and *Penseroso*:

"And may at length my weary age
Find out the peaceful hermitage,
The hairy gown and mossy cell,
Where I may sit, and rightly spell
Of every star that heaven doth shew,
And every herb that sips the dew,

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Till old experience do attain
To something like prophetic strain?"

Pope and Gray are generally considered as the most correct writers of rhyme; and Dryden, who knew the affluence of the English language, has in his own compositions exhibited all its various capacities of harmony and versification.

Blank verse is composed of lines of ten syllables each, which flow into each other without the intervention of rhymes; its metrical principle resides in its pauses, which should be so judiciously spread as never to suffer the accompaniment of rhyme to be missed. Of the few poets who have attempted this species of composition, Milton first, and after him, Thomson, Armstrong, Aken-side, and Cowper, are pre-eminent. The amplitude of Milton's verse is unequalled: it dilates with the author's thought, it harmonizes with the reader's sentiment, and its varied cadence alternately rolls with majesty, or falls in a mellifluous strain of melody on the unwearied and unsated ear. The principle of this exquisite mechanism has been lately referred by a judicious critic (the Rev. M. Crowe, in his Lectures at the Royal Institution), to Milton's bold practice of distributing in separate lines words so nearly connected (such as the preposition governing the noun, and the pronoun attached to the verb) as almost to appear indivisible. That this practice, which Mr. Crowe calls breaking the natural joint of the sentence, is favourable to the freedom of blank verse, cannot be disputed; but it may be questioned whether the poet was himself conscious of the mechanism which he employed, or was directed by any other principle than his own acute sensibility to harmony. The following short extracts may illustrate the difference of style perceptible in the various writers of blank verse:

"Of man's first disobedience, and the fruit
Of that forbidden tree whose mortal taste
Brought death into the world, and all our woe,
With loss of Eden, till one greater man
Restore us, and regain the blissful seat,
Sing, heavenly muse that on the secret top
Of Oreb, or of Sinai, didst inspire
The shepherd who first taught the chosen seed,
In the beginning how the heavens and earth
Rose out of chaos; or if Sion hill
Delight thee more, and Siloa's brook that flowed
Fast by the oracle of God, I thence
Invoke thy aid to my adventurous song;
That with no middle flight intends to soar
Above the Aonian mount, while it pursues
Things unattempted yet in prose or rhyme."

MILTON.

"He comes! he comes! in every breeze, the
power
Of philosophic melancholy comes:
His near approach the sudden-starting tear,
The glowing cheek, the mild dejected air,
The soften'd feature, and the beating heart,
Pierc'd deep with many a virtuous pang, declare.
O'er all the soul his sacred influence breathes,
Inflames imagination, through the breast
Infuses every tenderness, and far
Beyond dim earth exalts the swelling thought."

THOMSON.

"From heaven my strains begin; from heaven
descends
The flame of genius to the chosen heart,
And beauty with poetic wonder join'd
And inspiration. Ere the rising sun
Shone o'er the deep, or mid the vault of night
The moon her silver lamp suspended; ere

The vales with spring were watered, or with groves
Of oak, or pine, the ancient hills were crown'd;
Then the great Spirit whom his works adore,
Within his own deep essence view'd the forms,
The forms eternal of created things:
The radiant sun, the moon's nocturnal lamp,
The mountains and the streams, the ample stores
Of earth, of heaven, of nature. From the first,
On that full scene his love divine he fix'd,
His admiration; till in time complete,
What he admired and lov'd, his vital power
Unfolded into being."

AKENSIDE.

"O ye whose souls relentless love has tam'd
To soft distress, or friend untimely fallen!
Court not the luxury of tender thought;
Nor deem it impious to forget those pains
That hurt the living, nought avail the dead.
Go, soft enthusiast, quit the cypress groves;
Nor to the rivulet's lonely moanings tune
Your sad complaint. Go, seek the cheerful
haunts
Of men, and mingle with the bustling crowd;
Lay schemes for wealth, or power, or fame—the
wish
Of nobler minds, and push them night and day;
Or join the caravan, in quest of scenes
New to your eyes, and shifting every hour,
Beyond the Alps, beyond the Appenines."

ARMSTRONG.

"O winter, ruler of the inverted year,
Thy scattered hair, with sleet like ashes fill'd,
Thy breath congeal'd upon thy lips, thy cheeks
Fring'd with a beard made white with other
snows
Than those of age, thy forehead wrapt in clouds,
A leafless branch thy sceptre, and thy throne
A sliding car indebted to no wheels,
But urg'd by storms along its slippery way!
I love thee; all unlovely as thou seem'st,
And dreaded as thou art. Thou hold'st the sun
A prisoner in the yet undawning east,
Short'ning his journey between morn and noon,
And hurrying him, impatient of his stay,
Down to the rosy west; but kindly still
Compensating his loss with added hours
Of social converse, and instructive ease."

COWPER.

The defect of Young's blank verse is, that the sense commonly closes with the line, and that it has too much of the systematical uniformity, without the musical varieties, of rhyme. Whether rhyme or blank verse is entitled to pre-eminence, is a question which must ultimately be determined by individual taste. In the choice of his measure, the poet must obviously be influenced by the nature of his subject; and rhyme or blank verse will alternately obtain his preference. In all the gay and airy excursions of fancy, or the lighter touches of feeling, he will find in rhyme an auxiliary equally pleasing and important. To such compositions as require a measure of spirited and vivacious movement, rhyme is an indispensable appendage. To satire it adds poignancy, to humour it gives elegance; it imparts renovation to old ideas, and lends attraction to trivial sentiments; it renders familiar illustration graceful, and plain sense eloquent. In all but the Alpine regions of poetry, rhyme is a fence no less useful than ornamental, enriching and enlivening every object. In the Allegro and Penseroso, even Milton conceived it no dereliction of poetical freedom to have pursued the path traced out by his predecessors: but in his *Paradise Lost*,

when "he soared beyond the visible diurnal sphere," his deviation into blank verse was as judicious as fortunate; because his subject was then too sublime, his conceptions too gigantic, for the narrow limits and demarcations of rhyme. Wherever much originality of thought exists, this metrical charm is unnecessary; and where imagination reigns in wild luxuriance, it is impertinent. In some of his juvenile poems, Milton appears to have been incumbered with the dignity of his thoughts; and Shakspeare, perplexed by the richness and variety of his combinations, is apt to become affected when he quits blank verse. Attempts have been made to enlarge the limits of blank verse, by the introduction of various measures analogous to those employed in rhyme: but to all these efforts the genius of the language discovers an invincible repugnance; vainly are varieties presented to the eye, which are imperceptible to the mind, and untasted by the ear. All rhymeless numbers either flow into good blank verse, or form lines harsh and untractable; a succession of abrupt sounds and mutilated sentences, which by no art of typography, by no imposition of nomenclature, can be made to constitute any metre at all.

See farther the articles ELEGY, LYRIC, PASTORAL, SONNET, &c.

POGGE, in ichthyology. See COTTUS.

POGGIO (Bracciolini), a man of great parts and learning, who contributed much to the revival of knowledge in Europe, was born at Terranuova, in the territories of Florence, in 1380. His first public employment was that of writer of the apostolic letters, which he held 10 years, and was then made apostolic secretary, in which capacity he officiated 40 years, under seven popes. In 1453, when he was 72 years of age, he accepted the employment of secretary to the republic of Florence, to which place he removed, and died in 1459. He visited several countries, and searched many monasteries to recover ancient authors, numbers of which he brought to light: his own works consist of moral pieces, orations, letters, and a History of Florence from 1350 to 1455, which is the most considerable of them. His life has been lately published, in a 4to. volume, by Mr. Shepherd.

POGGY, an island in the Indian ocean, on the W. side of the island of Sumatra, and separated from the N. end of that of Nassau by a narrow channel. It is triangular, and about 20 miles in length. Lon. 99. 30 E. Lat. 2. 20 S.

POIGNANCY. *s.* (from *poignant*.) 1. The power of stimulating the palate; sharpness (*Swift*). 2. The power of irritation; asperity.

POIGNANT. *a.* (*poignant*, French.) 1. Sharp; stimulating the palate (*Locke*). 2. Severe; piercing; painful (*South*). 3. Irritating; satirical; keen.

POINCIANA. Barbadoes flower-fence. In botany, a genus of the class decandria, order monogynia. Calyx pentaphyllous; petals five, the uppermost largest; stamens long, all fertile; pericarp, a legume. One species only; *P. pulcherima*, a native of both the Indies. This rises with a straight stalk to the height of

ten or twelve feet; the branches terminate in loose spikes of flowers, sometimes pyramidal, and sometimes umbellate. The first stalk of each flower is about three inches long: the flower itself consists of five petals, roundish at the top, but contracted to narrow tails at the base. They are patent, and beautifully variegated with deep red, orange or yellow, often spotted with green; and emit a very agreeable odour. On the fading of the flower, the legume or pod into which the germ expands is about three inches long, divided into three or four cells, by transverse partitions, each including a single seed, flattish and irregular. The plant is propagated by seeds; but is too tender to flourish beyond the protection of a bark-stove.

POINT. *s.* (*point*, French.) 1. The sharp end of any thing (*Temple*). 2. A string with a tag (*Shakspeare*). 3. Headland; promontory (*Addison*). 4. A string of an epigram (*Dryden*). 5. An indivisible part of space (*Locke*). 6. An indivisible part of time; a moment, 7. A small space (*Prior*). 8. Punctilio; nicety (*Milton*). 9. Part required of time or space; critical moment; exact place (*Atterbury*). 10. Degree; state (*Sidney*). 11. Note of distinction in writing; a stop. 12. A spot; a part of a surface divided by spots; the ace or size *point*. 13. One of the degrees into which the circumference of the horizon, and the mariner's compass, is divided (*Bacon*). 14. Particular place to which any thing is directed (*Brown*). 15. Particular; particular mode (*Shakspeare*). 16. An aim; the act of aiming or striking (*Shakspeare*). 17. The particular thing required; the aim the thing *points* at (*Roscommon*). 18. Particular instance (*Temple*). 19. A single position; a single assertion; single part of a complicated question; a single part of any whole (*Baker*). 20. A note; a tune (*Shakspeare*). 21. *Pointblank*; directly: as, *an arrow is shot to the pointblank, or white mark* (*Shakspeare*). 22. *Point de vise*; exact or exactly in the point of view (*Bacon*).

POINT, in music, a mark or note anciently used to distinguish the tones or sounds: hence we still call it simple counter-point, when a note of the lower part answers exactly to that of an upper; and figurative counter-point, when any note is syncopeated, and one of the parts makes several notes or inflexions of the voice, while the other holds on one. We still use a point, to raise the value of a note, and prolong its time by one half, *e. g.* a point added to a semibreve instead of two minims, makes it equal to three; and so of the other notes. See the article TIME.

POINT, in astronomy, a term applied to certain points or places marked in the heavens, and distinguished by proper epithets. The four grand points or divisions of the horizon, viz. the east, west, north, and south, are called the cardinal points. The zenith and nadir are the vertical points; the points wherein the orbits of the planets cut the plane of the ecliptic are called the nodes: the points wherein the equator and ecliptic intersect are called the equinoctial

points; particularly, that whence the sun ascends towards the north pole, is called the vernal point; and that by which he descends to the south pole, the autumnal point. The points of the ecliptic, where the sun's ascent above the equator, and descent below it, terminate, are called the solstitial point; particularly the former of them, the estival or summer-point; the latter, the brumal or winter-point.

POINT, in the manufactories, is a general term, used for all kinds of laces wrought with the needle; such are the point de Venice, point de France, point de Genoa, &c., which are distinguished by the particular economy and arrangement of their points.—Point is sometimes used for lace woven with bobbins: as English point, point de Malines, point d'Havre, &c.

To POINT. v. a. (from the noun.) 1. To sharpen; to forge or grind to a point. 2. To direct toward an object, by way of forcing it on the notice (*Milton*). 3. To direct the eye or notice (*Pope*). 4. To show as by directing the finger (*Addison*). 5. (*pointer*, French.) To direct toward a place: *he pointed his gun*. 6. To distinguish by stops or points.

To POINT. v. n. 1. To note with the finger; to force on the notice, by directing the finger toward it (*Ray*). 2. To distinguish words or sentences by points (*Forbes*). 3. To indicate as dogs do to sportsmen (*Gay*). 4. To show distinctly (*Swift*).

POINTAL, in botany. See **PISTIL**.

POINTED. a. or participle. (from *point*.) 1. Sharp; having a sharp point or pique (*Dryden*). 2. Epigrammatical; abounding in conceits (*Pope*).

POINTEDLY. ad. (from *pointed*.) In a pointed manner (*Dryden*).

POINTEDNESS. s. (from *pointed*.) 1. Sharpness; pickiness with asperity (*Ben Jonson*). 2. Epigrammatical smartness (*Dryden*).

POINTEL. s. Any thing on a point (*Derham*).

POINTER. s. (from *point*.) Any thing that points (*Watts*).

POINTER, a variety of the domestic dog (see **CANIS**) well known to contribute very largely to the pleasures and pursuits of the sportsman. The breed, on account of its general utility, has been so perpetually crossed, re-crossed, bred in, and bred out, of late years, that it is now to be found of all sizes, and all qualifications; from the slow, short-headed, heavy-shouldered remains of the original Spanish pointer, that will tire in half a day's work, to the cross of in and in with a fox-hound, which is never known to tire; many of these having speed enough to catch a leveret three parts grown, when it jumps up before them. Pointers, forty or fifty years since, were hardly ever seen but entirely white, or variegated with liver-coloured spots; except the then duke of Kingston's black and white, which were considered superior to every breed in the kingdom, and sold for most extravagant sums after his

death. They are now, from the constantly increasing attachment to field sports, to be seen of every description, from pure white, and a flea-bit blue or grey, to a universal liver-colour, and a perfect black. In a choice of pointers for general use, that is for every species of game, the extremes in size, as well as in speed, are better avoided: overgrown, heavy dogs, soon get weary in the hot and early part of the season: and the very small sorts have their inconveniences in hunting in very high turnips, heath, broom-fields, &c.

As some advantages have been obtained by the various crosses, both in respect to speed, and ability to endure fatigue, so something has been sacrificed on the score of patience and keenness of smell. Pointers are never considered complete, unless they are perfectly staunch to bird, dog, and gun; which implies, first, standing singly to a bird or a covey; secondly, to backing (or pointing instantaneously likewise) the moment they perceive another dog stand; and lastly, not to stir from their point, upon the firing of any gun in company, provided the game is neither sprung nor started at which the original point was made.

The art of breaking pointers for the field was, twenty or thirty years since, looked upon as a very mysterious and difficult piece of business; many (called dog-breakers) deriving a subsistence from the employment: the charm, however, has been long since dispelled, and the process is known to be so exceedingly simple, that a tolerable well-bred pointer puppy may have the foundation of all his future perfections inculcated in the very kitchen or parlour of his master, before he is taken into the field. The system indeed is so easy that it may be applied to two or three brace together in a large room, or small yard, with no other assistance than the phrases "hie-on!" "to-ho!" "take heed!" and "have a care!" a small field whip being in hand to impress attention; when although meat be tossed before them in every direction, not a dog will stir till the signal of "hie-on" is heard, which they eagerly obey; but are as instantly stopped at the very moment of seizing their meat, by either of the other phrases. Young dogs, having thus imbibed the principles upon which they are to act, have nature, and their instinctive impulse, to point out their practice when brought into the field: few are seen who hunt too little, the larger part are inclined to range too widely, and then it is that the cool and steady patience of the experienced sportsman becomes necessary to check their impetuosity. Juvenile gunners frequently spoil young dogs, by keeping them under as little restraint as they wish to be kept under themselves; and too often let them break away out of all reasonable distance, till they acquire a habit of inattention and disobedience, of which some are with very great difficulty, if ever, divested.

When brought into the field, they should be taught to traverse every yard of the ground, (in proper lengths, and at proper distances,) so that

none be left unbeaten ; and this should be done with as few words, and as little noise, as possible. Short verbal signals, low vibrative whistles, and the motion of the hand to the right or left, are all that is necessary ; more does mischief : one steady shot-man of this description, with a brace of pointers obedient to command, and staunch to dog and gun, will kill more game in any country, than a noisy crew with three or four brace of dogs before them. No young pointers should be permitted to deviate from the proper rule of quartering the ground before them ; that is, they should be restricted to cover a line of fourscore yards transversely in the front of their master, taking forty yards to his right, and re-passing him, taking the same distance to the left ; and in such proportions as not to let their crossings and re-crossings be more than five-and-twenty or thirty yards from each other. If a brace of pointers be in the field, they should alternately cross the same beat, by meeting and passing each other ; but never beat the same way in a parallel direction.

Those who wish pointers to bring the game when killed will find it very easy of attainment, by teaching them to fetch and carry before they take the field ; it is an amusement they are much delighted with, and never forget : it has, however, one chance of inconvenience annexed to the experiment, for they may become hard-mouthed, and take to breaking both flesh and feather, which will be found extremely troublesome. It is a practice with some persons to hunt their pointers in coverts, with bells about their necks, both in cock and pheasant shooting ; those who do it, however, hold their pointers (at least their excellence) in very slender estimation, as it invariably reduces their speed ; renders them slow, tardy, undisciplined, and inclined to hang and puzzle, by constantly drawing upon the foot of the pheasant, or upon a hare in covert, when one happens to start before them. Previous to the beginning of the season, that is, a fortnight before the commencement, each dog should have two doses of physic about four days apart ; after which proper attention should be paid to the provision, which should be of a sweet and healthy kind, to preserve as much as possible their faculties in full perfection. From the hardness and heat of the ground in the first weeks of September, it sometimes happens, that the feet become lacerated, inflamed, and exceedingly sore ; when this is observed, a plentiful washing, with warm gruel and a sponge, will afford considerable relief ; in an hour or two after which, the application of some weak salt and water, or cold white-wine vinegar, will harden the surface, and probably prevent a repetition. See TRAINING.

POINTING. See PUNCTUATION.

POINTS, in electricity. See ELECTRICITY.

POINTINGSTOCK. *s.* (*pointing* and *stock*.) Something made the object of ridicule (*Shakspeare*).

POINTLESS. *a.* (from *point*.) Blunt ; not sharp ; obtuse (*Dryden*).

POISERS, in entomology, two pedicelled heads placed one under each wing of such insects as have only two.

POISON. (*venenum*, Lat.) Any substance which when applied to the animal frame, externally or internally, injures or destroys it by exciting morbid action. This is an extensive definition ; but the diversified nature of the substances that fall within the meaning of the term, and the multifarious mode of their action, prevent us from being able to limit it within narrow bounds. They may be contemplated under the four classes of animal, vegetable, mineral, and halituous or gaseous poisons.

Preliminarily, however, we will observe, that most of the substances properly called poisonous are only so in certain doses ; for below this point in the general scale, many of them form the most active and consequently the most valuable medicines of the dispensary. There are nevertheless some poisons which are deleterious and even fatal in the smallest quantities imaginable, and which are hence never administered medicinally ; such are those of hydrophobia and the plague. There are other poisons, again, which are innocent when taken into the stomach, but which prove deleterious when applied to the lungs, or to an abraded surface ; thus carbonic acid is continually swallowed with fermented liquors with impunity, and the poison of the viper may be taken in the same manner : whilst inspiring carbonic acid kills, and the poison of the viper inserted into the flesh often proves fatal.

There is again a third kind of substances which act as poisons whether applied externally or internally, as arsenic.

When a substance produces disease not only in mankind but in all animals, it is distinguished by the term common poison, as arsenic, sublimate, &c. whilst that which is poisonous to man only, or to animals, and often to one genus, is said to be a relative poison ; thus aloes are poisonous to dogs and wolves ; the phellandrium aquaticum kills horses, whilst oxen devour it greedily, and with impunity. It appears, then, that substances act as poisons only in regard to their dose, the part of the body they are applied to, and the subject.

Poisons may enter the body in the following ways :

1. Through the œsophagus with the food.
2. Through the anus with gylsters.
3. Through the nostrils with odorous substances.
4. Through the lungs with the air.
5. Through the absorbents of the skin, either whole, ulcerated, cut, or torn.

In regard to the nature of their constituent principles, they are divided into

1. Acrid poisons, as drastic and corrosive vegetables ; acid, alkaline, metallic, and acido-metallic minerals ; deleterious and necrotic animals.
2. Narcotic, as certain vegetables.
3. Narcotico-acrid, which kill with both principles.
4. Halituous, which suffocate by a noxious vapour.
5. Mechanical poisons, which act by their mechanical power.

In regard of the symptoms which are produced by poisons, they are divided into

POISON.

1. Inflammatory, which induce inflammation and gangrene.
 2. Drastic, which operate by purging and vomiting.
 3. Convulsive, which excite spasms and convulsions.
 4. Paralytic, which induce palsy of the extremities and heart: as lead preparations, the lauro-cerasus, &c.
 5. Narcotic, which cause coma, amaurosis, and delirium.
 6. Suffocative, which suffocate by a mephitic vapour.
 7. Exsiccant, which bring on tabes; as lead preparations.
 8. Sceptic, which induce a tendency to putridity in the blood and gangrene.
- We shall now offer a table of poisons under the four classes we have adverted to.

I. ANIMAL POISONS.

American snakes.

1. *Crotalus horridus*.
Its antidote is the radix seneka; volatile alkali, and common salt.
2. *Crotalus miliaris*.
3. *Crotalus dryinus*.
4. *Crotalus durissus*.
5. *Crotalus mutus*.
6. *Crotalus atropos*.
7. *Coluber heberis*.
8. *Coluber dipsas*.
9. *Coluber myctericans*.
10. *Coluber lacteus*.

The antidote to all these are the seneka root, volatile alkali, and common salt.

Asiatic serpents.

11. *Coluber naga*.
12. *Coluber severus*.
13. *Coluber stolatus*.
14. *Coluber atrox*.
15. *Coluber corallinus*.
16. *Coluber ammodytes*.
17. *Coluber lebetinus*.

The antidote to all these is the radix mungos internally, with the general caustic applications, extirpation, &c.

African serpents.

18. *Coluber vipera*.
19. *Coluber niveus*.
20. *Coluber haje*.

Caustic application, extirpation, &c. are generally adopted.

European serpents.

21. *Coluber berus*.

The leaves of the fraxinus, eau de luce, &c. are applied to the bite of this serpent.

22. *Coluber prester*.

Its antidote is olive oil.

23. *Coluber cherssea*.

Scarification, cupping glasses, and Spanish flies powdered are applied to the bite.

24. *Coluber aspis*.

Volatile alkali is here most efficacious, both internally and externally.

25. *Coluber illyricus*.

The radix gentiana, with mercury, are given internally.

Poisonous insects.

1. *Furia infernalis*.

Extirpation.

2. *Lytta vesicatoria*.

When Spanish flies are swallowed in too large a dose, emetics, purgatives, and mucilaginous and oily drinks are given.

3. *Meloe majalis*.

4. *Meloe proscarabæus*.

The same antidote as the Spanish fly.

5. *Scorpio Africanus*.

Its antidote is the application of oil.

6. *Phalangium arachnoides*.

Treacle is applied with success.

7. *Culex lanius*.

8. *Sirexigas*.

The antidote to these are oily applications.

9. *Buprestis*.

These insects, when swallowed, kill, unless oil and vomits are given.

10. *Aranea domestica*.

11. *Aranea tarantula*.

Applications of volatile alkali are most efficacious.

12. *Pulex Americanus*.

This very small insect penetrates the cuticle, and requires extirpation.

13. *Culex pipeas*.

14. *Culex pulicaris*.

Volatile alkali allays the swelling produced by these insects.

15. *Apis mellifica*.

16. *Vespa vulgaris*.

17. *Vespa crabro*.

Cold water with vinegar or sugar of lead, allay the mischief they create.

Poisonous worms.

1. *Gordius medenensis*.

This singular worm must be gradually twisted round any substance, and thus drawn out from underneath the skin.

2. *Gordius marinus*.

The internal use of antiscorbutics: this worm producing a species of leprosy.

3. *Hirudo venetatus*.

When this leach is swallowed, salt and water, and oil, must be taken to kill it.

4. *Tethys marina*.

5. *Urtica marina*.

Cold water and volatile alkali should be applied.

Amphibious poisonous animals.

1. *Rana bufo*.

2. *Lacerta geko*.

3. *Lacerta salamandra*.

Volatile alkaline applications, with cold water, are applied with advantage.

Poisonous fishes.

1. *Tetradon scellatus*.

2. *Tetradon lineatus*.

3. *Trachinus draco*.

4. *Perca venenosa*.

Vomits and acids of lemon are to be exhibited against these.

5. *Raia pastinaca*.

This produces a wound very difficult of cure.

6. *Raia torpedio*.

The touch of this fish produces a paralytic affection of the arm for some little time.

7. *Gymnotus electricus*.

This strikes the part which touches it like a shock of electricity.

POISON.

3. Sparus pagurus.

Emetics and acids are to be given when this is swallowed.

Other animal poisons.

1. Mytilus edulis.
2. Ostrea venenata.
3. Ovum putridum.
4. Pinguedo rancida.
5. Animal putridum.

Vomits are first to be given, then aromatics.

6. Miasma luis bovillæ.

The pustules and ulcers from the cow pox are cured by purgatives and detersive applications.

7. Virus rabiorum.

When hydrophobia is induced, no remedy has hitherto been found efficacious. Extirpation, immediately after the wound is inflicted, is the only certain prophylaxis.

8. Virus variolosum.
9. Virus morbillosum.
10. Virus scarlatinum.
11. Virus scabiosum.
12. Virus venereum.
13. Virus plicosum.
14. Virus cancrorum.
15. Virus leprosum.
16. Virus pestilential.

All these are considered under the medicinal treatment of small pox, measles, scarlatina, &c.

II. VEGETABLE POISONS.

Narcotic poisonous vegetables.

1. Papaver somniferum.

Vomits, acids, and the other anti-narcotics mentioned at the end of this table, are the antidotes.

2. Opium.

This requires the same antidotes.

3. Physalis somnifera.
4. Solanum lycopersicum.
5. Solanum mammosum.
6. Solanum insanum.
7. Solanum dulcamara.
8. Solanum nigrum.
9. Atropa mandragora.
10. Datura stramonium.
11. Datura metel.
12. Datura ferox.
13. Datura tatula.
14. Hyosciamus niger.

The antidotes are first vomits, which also purge, then vinegar and oil.

15. Hyosciamus albus.
16. Hyosciamus physalodes.
17. Hyosciamus scopolia.
18. Azalea pontica.
19. Antirrhinum orontium.
20. Actæa spicata.
21. Lolium temulentum.
22. Ervum ervilia.
23. Lathyrus cicera.
24. Peganum harmela.
25. Chenopodium hybridum.
26. Cheledonium glaucium.
27. Taxus baccata.
28. Lactuca virosa.
29. Lactuca scariolo.
30. Paris quadrifolia.
31. Prunus lauro-cerasus.

Against all these narcotics are recommended, after vomiting.

1. Acids; as vinegar, lemon juice, spirits of vitriol diluted.

2. A very strong infusion of Turkey coffee.

3. Small doses of ipecacuan, to promote a powerful sweating.

4. Glysters of vinegar, or soap dissolved.

5. Blisters to the neck.

6. Wine.

7. Alkaline salts and borax.

Narcotic and acrid vegetable poisons.

1. Hippomane manciella.

An emetic and purge, then milk and rice broth.

2. Hippomane biglandulosa.
3. Cocculus indicus.
4. Coriaria myrtifolia.
5. Strychnos nux vomica.
6. Strychnos colubrina.
7. Ignatia amara.
8. Nerium oleander.
9. Atropa belladonna.
10. Nicotiana tabacum.
11. Nicotiana rustica.
12. Nicotiana paniculata.
13. Nicotiana glutinosa.
14. Bryonia alba.
15. Chærophyllum sylvestre.
16. Chærophyllum bulbosum.
17. Chærophyllum temulentum.
18. Cethusa cynapium.
19. Sium latifolium.
20. Cicuta virosa.
21. Conium maculatum.
22. Mercurialis perennis.

Poisonous fungi.

1. Agaricus muscarius.
2. Agaricus integer venenatus, Krapff.
3. Agaricus integer viscidus, Krapff.
4. Agaricus lactifluus venenatus, Krapff.
5. Agaricus piperatus.
6. Agaricus fimetarius.
7. Agaricus pustulatus.
8. Agaricus necator.
9. Agaricus sanguineus.
10. Agaricus viscidus.
11. Agaricus clypeatus.
12. Boletus versicolor.
13. Boletus elegans.
14. Boleti parasitica.
15. Phallus impudicus.
16. Phallus mukusin.
17. Lycoperdon carcinomalis.
18. And several others not yet scientifically named.

Acrid vegetable poisons.

1. Delphinia staphisagria.
2. Veratrum sabadilla.
3. Rhododendron corysanthium.
4. Fritillaria imperialis.
5. Colchicum autumnale.
6. Pedicularis palustris.
7. Digitalis purpurea.
8. Cyclamen europæum.
9. Plumbago europæa.
10. Convolvulus scammonium.
11. Cucumis colocynthis.
12. Momordica elaterium.
13. Gambogia gutta.
14. Cerbera abhovei.
15. Cerbera manghas.

POISON.

16. *Cynanchum erectum*.
17. *Lobelia syphilitica*.
18. *Lobelia longifolia*.
19. *Cynanchum vimiale*.
20. *Apocynum androseifolium*.
21. *Apocynum cannabinum*.
22. *Apocynum venetum*.
23. *Asclepias gigantea*.
24. *Hydrocotyle vulgaris*.
25. *Oenanthe fistulosa*.
26. *Oenanthe crocata*.
27. *Scandix infesta*.
28. *Thapsia fetida*.
29. *Alisma plantago aquatica*.
30. *Clematis vitalba*.
31. *Clematis flammula*.
32. *Clematis recta*.
33. *Clematis integrifolia*.
34. *Anemone palmata*.
35. *Anemone pulsatilla*.
36. *Anemone pratensis*.
37. *Anemone narcissistora*.
38. *Anemone nemorosa*.
39. *Anemone ranunculoides*.
40. *Veratrum album*.
41. *Helleborus niger*.
42. *Helleborus foetidus*.
43. *Veratrum nigrum*.
44. *Caltha palustris*.
45. *Aconitum napellus*.
46. *Aconitum cammarum*.
47. *Aconitum lycoctonum*.
48. *Aconitum athora*.
49. *Pastinaca sativa annosa*.
50. *Polygonum hydropiper*.
51. *Sclanthus quadrifidus*.
52. *Sclanthus forskalli*.
53. *Sclanthus glandulosus*.
54. *Jatropha curcas*.
55. *Jatropha multifida*.
56. *Jatropha manihot*.
57. *Ricinus communis*.
58. *Phytolacca decandra*.
59. *Croton tiglium*.
60. *Daphne mezereum*.
61. *Daphne thymelæa*.
62. *Daphne laureola*.
63. *Daphne cneorum*.
64. *Daphne gnidium*.
65. *Cneorum tricoccum*.
66. *Amyris toxifera*.
67. *Rhus vernix*.
68. *Rhus radicans*.
69. *Rhus toxicodendron*.
70. *Scilla maritima*.
71. *Excoecaria agallocha*.
72. *Anacardium orientale*.
73. *Anacardium occidentale*.
74. *Caryota urens*.
75. *Arum maculatum*.
76. *Arum dracunculus*.
77. *Arum dracontium*.
78. *Arum colocasia*.
79. *Arum esculentum*.
80. *Arum virginicum*.
81. *Arum arborescens*.
82. *Arum seguinum*.
83. *Calla palustris*.
84. *Euphorbia officinarum*.
85. *Euphorbia antiquorum*.
86. *Euphorbia canariensis*.
87. *Euphorbia tirucalli*.
88. *Euphorbia peplus*.
89. *Euphorbia lathyrus*.

90. *Euphorbia helioscopia*.
91. *Euphorbia verrucosa*.
92. *Euphorbia platyphylla*.
93. *Euphorbia esula*.
94. *Euphorbia cyparissias*.
95. *Euphorbia hiberna*.
96. *Euphorbia characias*.
97. *Euphorbia amygdaloides*.
98. *Euphorbia sylvatica*.
99. *Euphorbia exigua acuta*.
100. *Euphorbia mauritanica*.
101. *Euphorbia nerifolia*.
102. *Ranunculus acris*.
103. *Ranunculus sceleratus*.
104. *Ranunculus flammula*.
105. *Ranunculus bulbosus*.
106. *Ranunculus ficaria*.
107. *Ranunculus thora*.
108. *Ranunculus arvensis*.
109. *Ranunculus lingua*.
110. *Ranunculus alpestris*.
111. *Ranunculus polyanthemus*.
112. *Ranunculus illyricus*.
113. *Ranunculus gramineus*.
114. *Ranunculus asiaticus*.
115. *Ranunculus aquatilis*.
116. *Ranunculus platanifolius*.
117. *Ranunculus breynia*.
118. *Ranunculus sardous*.
119. *Rhaphanus raphanistrum*.
120. *Secale cornutum*. Its antidote is milk.

The usual and most approved antidotes to all these are, after vomiting and purging, emollient substances; as panada, with butter, and wine and cordials to support the strength.

Glutinous vegetable poisons.

1. *Ilex aquifolium*.
2. *Viscum album*.
3. *Rosa canina*.

III. MINERAL POISONS.

Mechanical mineral poisons.

1. *Vitrum contusum*.
2. *Smalta*.
3. *Gemma adamas*.
4. *Amianthus plumosus*.
5. *Cuprum lapis lazuli*.
6. *Fuligo caminorum*.

Mucilaginous substances, with oil or butter, are found to be most serviceable against these.

Poisonous earths commonly so termed.

1. Gypsum.
2. Selenites.
3. Nitrum crystallus montana.

Mucilaginous and oily substances, with absorbent earth, are given to obviate the symptoms arising from these.

Poisonous acids.

1. Acidum sulphuricum.
2. Acidum muriaticum.
3. Acidum nitricum.
4. Acidum nitrosum.
5. Aqua regia.
6. Zincum vitriolatum.
7. Cuprum vitriolatum.
8. Ferrum vitriolatum.

Alkalis and oily medicines only are serviceable, and antiphlogistics.

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Alkaline poisons.

1. Natron purum.
2. Soda pura.
3. Aquæ ammoniæ pura.
4. Lapis causticus.
5. Aqua natri puri.
6. Calx pura.

Diluted acids are to be given immediately, then oily and mucilaginous substances.

Common metallic poisons.

1. Aurum fulminale.
2. Preparata argenti.
3. Preparata bismuthi.
4. Preparata cupri.
5. Preparata plumbi.
6. Preparata stanni.

Alkaline salts, vomiting after; with milk and oily foods.

Mercurial poisons.

1. Hydrargyrum muriatum.
2. Calomel as impurus.
3. Hydrargyrum muriatum mitis.
4. Calx hydrargyri alba.
5. Hydrargyrum nitratum ruber.
6. Hydrargyrum vitriolatum.

Alkaline salts are recommended as the best antidotes against mercurial poisons.

Antimonial poisons.

1. Antimonium.
2. Antimonium sublimatum.
3. Antimonium muriatum.
4. Vitrum antimonii.
5. Crocos antimonii.
6. Antimonium tartarisatum.
7. Mercurius vitæ.
8. Hepar antimonii.
9. Sulphur antimonii præcipitatum.

Oily and mucilaginous substances, with cordials, and then opium, allay the violent vomiting and purging usually produced by antimonial preparations.

Arsenical poisons.

1. Arsenicum album.
2. Arsenicum flavum.
3. Arsenicum rubrum.
4. Auripigmentum.
5. Arsenicum.
6. Arsenicum porosum.
7. Cobaltum arsenicale.

The hepar sulphuris is found the best antidote against arsenical preparations.

IV. GASSEOUS OR HALITUOUS POISONS.

Poisonous mineral acid vapours.

1. Halitus sulphuris accensi.
2. Gaz acidi sulphurici.
3. Gaz acidi muriatici.
4. Gaz acidi nitrosi.
5. Gaz acidum carbonicum.
 - a. In the Grotto del Cano, &c.
 - b. From fermenting liquors.
 - c. From fermenting dough.
 - d. From the waters of Pyrmont, &c.
 - e. From the burning of lime.
 - f. From the burning of bricks, &c.

Pure air thrown into the lungs through a tube introduced into the trachea; stimulating volatile applications thrown into the stomach, and tobacco glysters, are recommended.

Poisonous alkaline vapours.

1. Alkali volatile, from putrid urine, &c.

Putrid vapours.

1. From dead putrifying animals.
2. From dead putrifying vegetables.
3. Air corrupted by breathing.
4. Air corrupted by animal perspiration.

The best antidote is pure air.

The most difficult poisons to be detected by those who are not acquainted with the nature of chemical re-agents are the metallic, and they are among those that most frequently produce mischief upon an extensive scale; especially the oxyds of copper and of lead, which are so often found injurious in culinary preparations from their metals being so largely employed in the manufacture of culinary vessels. All these are best detected by those substances which have of late years been called colourific acids, as sulphuretted hydrogen, Prussic acid, gallic acid, and tannin. All these act, even in small quantities, with great energy upon metallic solutions, however minute the quantity of metal dissolved, entering into a combination with the oxyds, and precipitating them in powders remarkable for the intensity and variety of their colours. The first, however, is the most active and the most comprehensive in its operation; and is hence that which is most usually resorted to on such occasions.

We have said that poisonous substances produce very different effects according to the manner they are introduced into the system: a very curious subject of enquiry, and which has within the last year or two been pursued so successfully, and with such singular results by Mr. Brodie, that we shall make no apology to our readers for copying the following extract from his paper upon this subject, introduced into the Philosophical Transactions for 1811.

"The substances, observes Mr. Brodie, which act as poisons when applied to the animal body are very numerous. In the experiments which I have hitherto made, I have employed vegetable poisons only. Of these I have selected such as are very active and certain in producing their effects, believing that, on this account, the exact nature of those effects would be more readily ascertained. The principal objects which I have kept in view have been to determine, on which of the vital organs the poison employed exercises its primary influence, and through what medium that organ becomes affected. I have also endeavoured to ascertain by what means the fatal consequences of some poisons may be prevented. With some of the conclusions which I have ventured to draw, so far as I know, we were not before acquainted; and others of them, though not entirely new, had not been previously established by satisfactory experiments.

I shall relate first those experiments in which poisons were employed internally, that is, to the mucous membranes of the tongue or alimentary canal, and afterwards those in which poisons were applied to wounded surfaces.

I. EXPERIMENTS WITH POISONS APPLIED TO THE TONGUE OR ALIMENTARY CANAL.

Alcohol.

When spirits are taken into the stomach in a certain quantity, they produce that kind of delirium which constitutes intoxication: when taken in a larger quantity, it is well known that they destroy life altogether, and that in the

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course of a very short space of time. Intoxication is a derangement of the functions of the mind, and, as these are in some way connected with those of the brain, it seems probable, that it is by acting on this organ that spirits when taken into the stomach occasion death. In order to ascertain how far this conclusion is just, I made the following experiments.

Exp. 1.—I poured two drachms of proof spirits down the œsophagus of a cat. Instantly he struggled violently; then lay on one side, perfectly motionless and insensible; the breathing was laboured and stertorous, and the pulsations of the heart were very frequent. He continued in this state for seven or eight minutes; then began to recover; the respirations became easier, and presently he stood up, and was able to walk.

Exp. 2.—I injected an ounce and a half of proof spirits into the stomach of a large full-grown rabbit, by means of an elastic gum tube passed down the œsophagus. The same symptoms took place as in the last experiment; but the animal did not begin to recover from the state of insensibility until forty minutes had elapsed from the time of the injection.

Exp. 3.—Seven drachms of proof spirits were injected into the stomach of a young rabbit. Two minutes afterwards, he was evidently affected by the spirits, and in three minutes more he lay on one side motionless and insensible. The pupils of the eyes were perfectly dilated; there were occasional slight convulsive motions of the extremities; the respiration was laborious, it was gradually performed at longer and longer intervals, and at the end of an hour and fifteen minutes had entirely ceased. Two minutes after the animal was apparently dead, I opened into the thorax, and found the heart acting with moderate force and frequency, circulating dark-coloured blood. I introduced a tube into the trachea, and produced artificial respiration by inflating the lungs, and found that by these means the action of the heart might be kept up to the natural standard, as in an animal from whom the head is removed.

Exp. 4.—I injected into the stomach of a rabbit two ounces of proof spirits. The injection was scarcely completed, when the animal became perfectly insensible. Precisely the same symptoms took place as in the last experiment, and at the end of twenty-seven minutes, from the time of the injection, the rabbit was apparently dead; but on examining the thorax the heart was found still acting, as in the last experiment.

It has been shown by M. Bichat, and the observation has been confirmed by some experiments which I have lately had the honour of communicating to this learned society, that the brain is not directly necessary to the action of the heart, and that when the functions of the brain are destroyed, the heart continues to contract for some time afterwards, and then ceases only in consequence of the suspension of respiration, which is under the influence of the brain.

It would appear, from the experiments which I have just detailed, that the symptoms produced by a large quantity of spirits taken into the stomach arise entirely from disturbance of the functions of the brain. The complete insensibility to external impressions; the dilatation of the pupils of the eyes; and the loss of motion, indicate that the functions of this organ are suspended; respiration, which is under its influence, is ill performed, and at last altogether ceases; while the heart, to the action of which the brain is not directly ne-

cessary, continues to contract, circulating dark-coloured blood for some time afterwards.

There is a striking analogy between the symptoms arising from spirits taken internally, and those produced by injuries of the brain.

Concussion of the brain, which may be considered as the slightest degree of injury, occasions a state of mind resembling intoxication; and the resemblance in some instances is so complete, that the most accurate observer cannot form a diagnosis, except from the history of the case. Pressure on the brain, which is a more severe injury than concussion, produces loss of motion, insensibility, dilatation of the pupils; respiration becomes laboured and stertorous, is performed at long intervals, and at last altogether ceases, and the patient dies.

It forms an interesting matter of enquiry, whether spirits when taken into the stomach produce their effects on the brain by being absorbed into the circulation, or in consequence of the sympathy that exists between these organs by means of the nerves. The following circumstances lead me to conclude that they act in the last of these two ways.

1. In experiments where animals have been killed by the injection of spirits into the stomach, I have found this organ to bear the marks of great inflammation, but never found any preternatural appearances whatever in the brain. 2. The effects of spirits taken into the stomach in the last experiment were so instantaneous, that it appears impossible that absorption should have taken place before they were produced. 3. A person who is intoxicated, frequently becomes suddenly sober after vomiting. 4. In the experiments which I have just related, I mixed tincture of rhubarb with the spirits, knowing from the experiments of Mr. Home, and Mr. William Brande, that this, when absorbed into the circulation, was readily separated from the blood by the kidneys, and that very small quantities might be detected in the urine by the addition of potash; but, though I never failed to find urine in the bladder, I never detected rhubarb in it.

The including the termination of the thoracic duct in a ligature does not prevent spirits, when taken into the stomach, from producing their usual effects on the nervous system; but subsequent observations, which Mr. Home has already communicated to this society, have shown that no conclusion can be drawn from this experiment.

That a poison may affect a distant organ, through the medium of the nerves, without entering the circulation, is proved by the well-known circumstance of solution of the extract of belladonna, when applied to the tunica conjunctiva of the eye, occasioning dilatation of the pupil of the same eye, though no other part of the system is affected.

It has been formerly supposed by Dr. Mead and other physiologists, that a poison may produce death by acting on the extremities of the nerves of the stomach and intestines, without being absorbed into the circulation. That it should by these means be capable of affecting the brain is not to be wondered at, when we consider the numerous and various sympathies between this organ and the alimentary canal, evidently independent of any other communication than the nerves.

Essential oil of bitter almonds.

Exp. 5.—One drop of the essential oil of bitter
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almonds was applied to the tongue of a young cat. She was instantly ceased with violent convulsions, then lay on one side motionless, insensible; breathing in a hurried manner; the respirations became laboured, took place at longer and longer intervals, and at the end of five minutes, from the application of the poison, had entirely ceased, and the animal was apparently dead; but on opening the thorax, the heart was found acting regularly eighty times in a minute; circulating dark-coloured blood, and it continued to act for six or seven minutes afterwards.

Exp. 6.—I injected into the rectum of a cat half an ounce of water, with two drops of the essential oil. In two minutes afterwards, he was affected with symptoms similar to those which occurred in the last experiment, and at the end of five minutes, from the injection of the poison, he was apparently dead. Two minutes after apparent death, the heart was found acting eighty times in a minute. On dissection, no preternatural appearances were found either in the internal membrane of the rectum, or the brain.

The symptoms produced by this poison, and the circumstance of the heart continuing to contract after apparent death, lead to the conclusion that it occasions death by disturbing the functions of the brain.

While engaged in these last experiments, I dipped the blunt end of a probe into the essential oil, and applied it to my tongue, meaning to taste it, and having no suspicion that so small a quantity could produce any of its specific effects on the nervous system; but scarcely had I applied it, when I experienced a very remarkable and unpleasant sensation, which I referred chiefly to the epigastric region, but the exact nature of which I cannot describe, because I know nothing precisely similar to it. At the same time there was a sense of weakness in my limbs, as if I had not the command of my muscles, and I thought that I was about to fall. However, these sensations were momentary, and I experienced no inconvenience whatever afterwards.

I afterwards applied a more minute quantity of the essential oil to my tongue several times, without experiencing from it any disagreeable effects; but on applying a larger quantity, I was affected with the same momentary sensations as in the former instance, and there was a recurrence of them in three or four seconds after the first attack had subsided.

From the instantaneousness with which the effects are produced; and from its acting more speedily, when applied to the tongue than when injected into the intestine, though the latter presents a better absorbing surface, we may conclude that this poison acts on the brain through the medium of the nerves, without being absorbed into the circulation.

Juice of the leaves of aconite.

Exp. 7.—An ounce of this juice was injected into the rectum of a cat. Three minutes afterwards he voided what appeared to be nearly the whole of the injection; he then stood for some minutes perfectly motionless, with his legs drawn together; at the end of nine minutes, from the time of the injection, he retched and vomited; he then attempted to walk, but faltered and fell at every step, as if from giddiness. At the end of thirteen minutes, he lay on one side insensible, motionless, except some slight convulsive motions

of the limbs. The respiration became slow and laboured; and at forty-seven minutes from the time of the injection, he was apparently dead. One minute and a half afterwards, the heart was found contracting regularly one hundred times in a minute.

It appears from this experiment, that the juice of aconite, when injected into the intestine, occasions death by destroying the functions of the brain. From the analogy of other poisons, it is rendered probable that it acts on the brain through the medium of the nerves, without being absorbed into the circulation. This opinion is confirmed by the following circumstance: if a small quantity of the leaf of aconite is chewed, it occasions a remarkable sense of numbness of the lips and gums, which does not subside for two or three hours.

Infusion of tobacco.

Exp. 8.—Four ounces of infusion of tobacco were injected into the rectum of a dog. Four minutes afterwards he retched, but did not vomit; he then became faint, and lay motionless on one side; at the end of nine minutes from the time of the injection, the heart could not be felt; he gasped for breath at long intervals; and in another minute there was no appearance whatever of life. I immediately laid open the cavities of the thorax and abdomen. The heart was much distended, and had entirely ceased to contract; there was no peristaltic motion of the intestines.

Exp. 9.—An ounce of very strong infusion of tobacco was injected into the rectum of a cat. Symptoms were produced similar to those which occurred in the last experiment, and the animal died at the end of seven minutes from the time of the injection. On opening the thorax immediately after death, the heart was found extremely distended, and to have entirely ceased acting, with the exception of a slight tremulous motion of the auricles.

Exp. 10.—Three ounces of infusion of tobacco were injected into the rectum of a dog. He was affected with symptoms similar to those in the former experiments, and died at the end of ten minutes. On opening the thorax immediately after death, I found the heart much distended, and to have entirely ceased contracting.

Exp. 11.—Three ounces of infusion of tobacco were injected into the rectum of a dog. Immediately there took place tremulous contractions of the voluntary muscles. Five minutes afterwards the injection was repeated in the same quantity. The dog then was sick, and threw up some of the infusion, with other matter, from the stomach; he became faint, and died ten minutes after the second injection. Immediately after respiration had ceased, I opened the thorax, and found the heart extremely extended, and without any evident contraction, except of the appendix of the right auricle, which every now and then contracted in a slight degree. I divided the pericardium on the right side. In consequence of the extreme distension of the heart, this could not be done without irritating the fibres with the point of the scalpel. Immediately both auricles and ventricles began to contract with considerable force, so as to restore the circulation. Artificial respiration was produced, and the circulation was kept up for more than half an hour, beyond which time the experiment was not continued.

We may conclude from these experiments, that the effect of the infusion of tobacco, when injected

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into the intestine of a living animal, is to destroy the action of the heart, stopping the circulation and producing syncope. It appeared to me that the action of the heart ceased even before the animal had ceased to respire; and this was confirmed by another experiment, in which, in a dog killed by the infusion of tobacco, I found the cavities of the left side of the heart to contain scarlet blood, while in those of the right side the blood was dark-coloured. This poison therefore differs materially from alcohol, the essential oil of almonds, and the juice of aconite, which have no direct influence on the action of the heart. The infusion of tobacco renders the heart insensible to the stimulus of the blood, but it does not altogether destroy the power of muscular contraction, since the heart resumed its action in one instance on the division of the pericardium, and I have found that the voluntary muscles of an animal killed by this poison are as readily stimulated to contract by the influence of the Voltaic battery, as if it had been killed in any other manner. At the same time, however, that the infusion of tobacco destroys the action of the heart, it appears to destroy also the functions of the brain, since these did not return in the last experiment; although the circulation was restored, and kept up by artificial respiration.

Since there is no direct communication between the intestinal canal and the heart, I was at first induced to suppose that the latter becomes affected in consequence of the infusion being conveyed into the blood by absorption. Some circumstances in the following experiment have since led me to doubt whether this is the case.

Exp. 12.—In a dog, whose head was removed, I kept up the circulation by means of artificial respiration, in the manner already described in the account of some experiments which I lately communicated to this society. I then injected into the stomach and intestines nine ounces of infusion of tobacco. At the time of the injection, the body of the animal lay perfectly quiet and motionless on the table; the heart acted regularly one hundred times in a minute. Ten minutes afterwards the pulse rose to one hundred and forty in a minute; the peristaltic motion of the intestines was much increased, and the voluntary muscles in every part of the body were thrown into repeated and violent spasmodic action. The joints of the extremities were alternately bent and extended; the muscles of the spine, abdomen, and tail alternately relaxed and contracted, so as to turn the whole animal from one side to the other. I have observed, in other instances, spasmodic actions of the muscles, where the circulation was kept up by artificial respiration, after the removal of the head, but not at all to be compared, either in strength or frequency, with those which took place on this occasion. I made pressure on the abdominal aorta for more than a minute, so as to obstruct the circulation of the blood in the lower extremities; but the muscular contractions were not lessened in consequence. Half an hour after the injection of the infusion, the artificial respiration was discontinued. The heart continued to act, circulating dark-coloured blood; the muscular contractions continued, but gradually diminished, in strength and frequency. I tied a ligature round the vessels at the base of the heart, so as to stop the circulation; nevertheless the muscular contractions still continued, though less frequent and forcible than before, and some minutes elapsed before they entirely ceased.

In this experiment, the disposition to contraction in the muscles was very much increased, instead of being diminished, as in those just related. If the infusion of tobacco influences the heart from being absorbed into the blood, and thus coming into actual contact with its fibres, there is no evident reason why the removal of the brain, and the employment of artificial respiration, should occasion so material a difference in its effects. If the contractions of the voluntary muscles had depended on the infusion circulating with the blood, it is reasonable to suppose that the pressure on the aorta would have occasioned some diminution of them, and that the complete obstruction of the circulation would have caused them to cease altogether.

From these considerations, I am induced, on the whole, to believe that the infusion of tobacco, when injected into the intestines, influences the heart through the medium of the nervous system; but I have not been able to devise any experiment, by which the truth or fallacy of this opinion might be put beyond the reach of doubt.

It appears remarkable, that the brain and nervous system, although not necessary to the action of the heart, should, when under the influence of the infusion of tobacco, be capable of influencing this organ so as to stop its action; but this is analogous to what we see occur in consequence of violent emotions of the mind. Those states of the nervous system which accompany the passions of joy, fear, or anger, when existing in a moderate degree, render the heart more sensible to the stimulus of the blood, and increase the frequency of its contractions; while, when the same passions exist in a greater degree, the heart is rendered altogether insensible to the stimulus of the blood, and syncope ensues.

Empyreumatic oil of tobacco.

Exp. 13.—Less than a drop of this oil was applied to the tongue of a young cat. Instantly violent convulsions took place in all the muscles, and the respirations became very frequent. In five minutes after the application, she lay on one side insensible, with slight spasmodic actions of the muscles. At the end of eleven minutes she retched, but did not vomit. In a quarter of an hour she appeared to be recovering. I repeated the application of the poison, and she was again seized with violent convulsions, and became insensible, breathing at long intervals; and in two minutes from the second application respiration had entirely ceased, and she was apparently dead. On opening the thorax, I found the heart acting with regularity and strength, circulating dark-coloured blood. I introduced a tube into the trachea, and produced artificial respiration; the contractions of the heart became augmented in force and frequency, and there was no evident diminution in six or seven minutes, during which the artificial respiration was continued.

On dissection, nothing remarkable was found in the appearance of the tongue or brain.

The symptoms and mode of death, in this experiment, did not essentially differ from those produced by the essential oil of almonds. I was surprised to find the effects of the empyreumatic oil so entirely different from those of the infusion of tobacco. Supposing that this difference might arise from the poison being more concentrated in the oil than in the infusion, I made the following experiments.

Exp. 14.—A drop of the oil of tobacco was sus-

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pended in an ounce and a half of water by means of muelleage of gum arabic, and the whole was injected into the rectum of a dog. In two minutes afterwards he became faint, retched, but did not vomit. He appeared to be recovering from this state, and in twenty-five minutes after the first injection it was repeated in the same quantity. He was then seized with symptoms similar to those in the last experiment, and in two minutes and a half he was apparently dead.

Two minutes after apparent death, on the thorax being opened into, the heart was found acting regularly one hundred times in a minute, and it continued acting for several minutes.

Exp. 15.—A drop of the empyreumatic oil of tobacco with an ounce of water was injected into the rectum of a cat. The symptoms produced were in essential circumstances similar to those which occurred in the last experiment. The animal was apparently dead five minutes after the injection, and the heart continued to contract for several minutes afterwards.

We may conclude from these experiments, that the empyreumatic oil of tobacco, whether applied to the tongue or injected into the intestine, does not stop the action of the heart and induce syncope, like the infusion of tobacco; but that it occasions death by destroying the functions of the brain, without directly acting on the circulation. In other words, its effects are similar to those of alcohol, the juice of aconite, and the essential oil of almonds.

XL. EXPERIMENTS WITH POISONS APPLIED TO WOUNDED SURFACES.

Essential oil of almonds.

Exp. 16.—I made an incision in the thigh of a rabbit, and introduced two drops of essential oil between the skin and the muscles. In four minutes after the application, he was seized with violent convulsions, and became insensible, and in two minutes more he was apparently dead; but the heart was felt through the ribs acting one hundred and twenty times in a minute, and it continued acting for several minutes. There were no other appearances in the limb than would have resulted from an ordinary wound.

Exp. 17.—Two drops of the essential oil of almonds were introduced into a wound in the side of a mouse. Two minutes afterwards he was affected with symptoms similar to those which occurred in the last experiment, and in two minutes more he was apparently dead, but the heart continued to contract for some minutes afterwards.

From the experiments which I have just related, and from others which it appears unnecessary to detail, as the general results were the same, I have learned that where the essential oil of almonds is applied to a wound, its effects are not so instantaneous as when it is applied to the tongue; otherwise there is no difference in its effects, in whatever manner it is applied.

Juice of the leaves of aconite.

Exp. 18.—I made a wound in the side of a young rabbit, and introduced, between the skin and muscles, about twenty drops of the juice of aconite. Twenty-three minutes afterwards he was affected with symptoms in all essential respects similar to those which occurred in an experiment already related, where the juice was injected into the rectum, and at the end of forty-seven minutes from the application of the poison

he was apparently dead. Two minutes after apparent death, the heart was found contracting, but very feebly.

Woorara.

The woorara is a poison with which the Indians of Guiana arm the points of their arrows. It appears not to differ essentially from the ticunas, which was employed in the experiments of the Abbé Fontana.

Exp. 19.—A small quantity of the woorara in powder was applied to a wound in the side of a Guinea pig. Ten minutes afterwards the animal was unable to walk; then he became quite motionless, except some slight occasional convulsions. He gradually became insensible; the respirations were laboured, and at the end of fourteen minutes from the application of the poison the respiration had entirely ceased, and he was apparently dead; but on opening the thorax, the heart was found acting seventy times in a minute, circulating dark-coloured blood, and it continued to contract for several minutes afterwards. On dissection no preternatural appearances were observed in the brain, nor was there any other appearance in the limb than would have arisen from an ordinary wound.

Exp. 20.—I made a wound in the side of a Guinea pig, and introduced into it about two grains of the woorara in powder. At the end of twenty-five minutes, symptoms took place very similar to those which occurred in the last experiment, and in thirteen minutes more the animal was apparently dead; but the heart continued to contract one hundred and eight times in a minute, and by means of artificial respiration the circulation was kept up for more than twenty minutes.

The results of other experiments which I have made with the woorara were similar to those just described. The heart continued to act after apparent death, and the circulation might be kept up by means of artificial respiration. It is evident that this poison acts in some way or other on the brain, and that the cessation of the functions of this organ is the immediate cause of death.

I found in these experiments, that the best mode of applying the woorara is when it is dissolved in water to the consistence of a thin paste. I first made the wound, and then smeared the poison over it with the end of the scalpel. I found that the animal was more speedily and certainly affected if there was some hæmorrhage, unless the hæmorrhage was very copious, when it produced an opposite effect, by washing the poison away from the wound. When the poison was applied in large quantity, it sometimes began to act in six or seven minutes. Never more than half an hour elapsed from the time of the poison being inserted to that of the animal being affected, except in one instance, where a ligature was applied on the limb, which will be mentioned afterwards. The woorara, which I employed, had been preserved for some years, which will account for its having been less active than it has been described to be by those who had witnessed its effects when in a recent state.

Upas antiar.

The island of Java produces two powerful vegetable poisons, to one of which the natives give the name of upas tieutè, and to the other that of upas antiar.

Exp. 21.—About two grains of this poison were

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made into a thin paste with water, and inserted into a wound in the thigh of a dog. Twelve minutes afterwards he became languid; at the end of fifteen minutes, the heart was found to beat very irregularly, and with frequent intermissions; after this, he had a slight rigor. At the end of twenty minutes, the heart beat very feebly and irregularly; he was languid; was sick and vomited; but the respirations were as frequent and as full as under natural circumstances, and he was perfectly sensible. At the end of twenty minutes he suddenly fell on one side, and was apparently dead. I immediately opened into the thorax, and found the heart distended with blood in a very remarkable degree, and to have entirely ceased contracting. There was one distinct and full inspiration after I had begun making the incision into the thorax. The cavities of the left side of the heart contained scarlet blood, and those of the right side contained dark-coloured blood, as in a living animal.

Exp. 22.—A small quantity of the upas antiar, prepared as before, was inserted into a wound in the thigh of a young cat. She appeared languid in two minutes after the poison was inserted. The symptoms which took place did not essentially differ from those which occurred in the last experiment, except that there were some convulsive motions of the limbs. At eight minutes after the poison was inserted, she lay on one side motionless and insensible, the heart could not be felt, but the respiration had not entirely ceased. On opening into the thorax, I found the heart to have ceased contracting. It was much distended with blood; and the blood in the cavities of the left side was of a scarlet colour. There were two full inspirations after the incision of the thorax was begun. On irritating the heart with the point of the scalpel, slight contractions took place in the fibres of the appendices of the auricles, but none in any other part.

Exp. 23.—The experiment was repeated on a rabbit. The symptoms produced were similar to those in the last experiment; but the animal did not vomit, and the convulsive motions were in a less degree: he died eleven minutes after the poison was inserted. On opening the chest, the heart was found to have entirely ceased contracting; it was much distended with blood; and the blood in the cavities on the left side was of a scarlet colour. On irritating the heart with the point of the scalpel, the ventricles contracted, but not sufficiently to restore the circulation.

Exp. 24.—About a grain of the upas antiar was inserted into a wound in the side of a rabbit. He was affected with symptoms similar to those before described, and died in ten minutes after the poison was applied. On opening the thorax immediately after death, the heart was found to have ceased contracting, and the blood in the cavities of the left side was of a scarlet colour.

It appears from these experiments, that the upas antiar, when inserted into a wound, produces death (as infusion of tobacco does when injected into the intestines) by rendering the heart insensible to the stimulus of the blood, and stopping the circulation. The heart beats feebly and irregularly before either the functions of the mind or the respiration appear to be affected. Respiration is performed even after the circulation has ceased; and the left side of the heart is found after death to contain scarlet blood, which never can be the case where the cause of death is the cessation of the functions of the brain or lungs. The convulsions which occur when the circulation has

nearly ceased, probably arise from the diminution of the supply of blood to the brain, resembling those which take place in a person who is dying from hæmorrhage.

There remains an interesting subject of enquiry, "through what medium do poisons influence the brain when applied to wounds?" That poisons applied in this manner do not produce their effects precisely in the same way as poisons taken internally, is rendered probable by this circumstance; that some poisons, which are very powerful when applied to wounds even in small quantities, are either altogether inefficient when taken internally, or require to be given in very large quantities, in order to produce their effect, and *vice versa*.

A poison applied to a wounded surface may be supposed to act on the brain in one of three ways.

1. By means of the nerves, like poisons taken internally.

2. By passing into the circulation through the absorbent vessels.

3. By passing directly into the circulation through the divided veins.

Exp. 25.—In order to ascertain whether the woorara acts through the medium of the nerves, I exposed the axilla of a rabbit, and divided the spinal nerves supplying the upper extremity, just before they unite to form the axillary plexus. The operation was performed with the greatest care. I not only divided every nervous filament, however small, which I could detect, but every portion of cellular membrane in the axilla, so that the artery and vein were left entirely insulated. I then made two wounds in the fore-arm, and inserted into them some of the woorara formed into a paste. Fourteen minutes after the poison was applied, the hind legs became paralytic, and in ten minutes more he died, with symptoms precisely similar to those which took place in the former experiments, and the heart continued to act after apparent death. On dissection, the nerves of the upper extremity were particularly examined, but not the smallest filament could be found undivided.

I made the following experiment, to ascertain whether the woorara passes into the circulation through the absorbent vessels.

Exp. 26.—I tied a ligature round the thoracic duct of a dog, just before it perforates the angle of the left subclavian, and jugular veins. I then made two wounds in the left hind leg, and introduced some of the woorara in powder into them. In less than a quarter of an hour he became affected with the usual symptoms, and died in a few minutes afterwards.

After death, I dissected the thoracic duct with great care. I found it to have been perfectly secured by the ligature. It was very much distended with chyle; and about two inches below its termination its coats had given way, and chyle was extravasated into the cellular membrane. The lymphatic vessels in the left axilla were distended in a very remarkable degree; and on dividing them, not less than a drachm of lymph issued from the divided ends.

Since neither the division of the nerves nor the obstruction of the thoracic duct interfere in the slightest degree with the effects of the woorara, there is presumptive evidence that it acts on the brain by entering the circulation through the divided veins. I endeavoured to ascertain, by experiment, whether this is really the case.

To apply ligatures to the large vessels of a limb

POISON.

only would evidently lead to no satisfactory conclusion, since the anastomosing vessels might still carry on the circulation. The only way which I could devise of performing the experiment was to include all the vessels, small as well as large, in a ligature.

Exp. 27.—In order to make the experiment more satisfactorily, I exposed the sciatic nerve of a rabbit in the upper and posterior part of the thigh, and passed under it a tape half an inch wide. I then made a wound in the leg, and having introduced into it some of the woorara mixed with water, I tied the tape moderately tight on the fore-part of the thigh. Thus I interrupted the communication between the wounds and the other parts of the body, by means of the vessels, while that by means of the nerve still remained. After the ligature was tightened, I applied the woorara a second time, in another part of the leg. The rabbit was not at all affected, and at the end of an hour I removed the ligature. Being engaged in some other pursuit, I did not watch the animal so closely as I should otherwise have done; but twenty minutes after the ligature was removed, I found him lying on one side motionless and insensible, evidently under the influence of the poison; but the symptoms were less violent than in most instances, and after lying in this state he recovered, and the limb became perfectly warm, and he regained the power of using it.

Exp. 28.—I repeated the last experiment with this difference, that after having applied the poison, I made the ligature as tight as I could draw it. I removed the ligature at the end of an hour and twenty minutes, but the animal was not at all affected either before or after the removal of the ligature, and on the following day he had recovered the use of the limb.

Exp. 29.—I repeated the experiment a third time, drawing the ligature very tight. At the end of forty-five minutes the animal continued perfectly well, and the ligature was removed. I watched him for three quarters of an hour afterwards, but there were no symptoms of his being affected by the poison. On the following day the rabbit died; but this I attribute to the injury done to the limb and sciatic nerve by the ligature, as there was the appearance of inflammation in the parts in the neighbourhood of the ligature.

These three experiments were made with the greatest care. From the mode in which the poison was applied, from the quantity employed, and from my prior experience, I should have entertained not the smallest doubt of the poison taking effect in every instance in less than twenty minutes, if no ligature had been applied. In two of the three, the quantity of woorara was more than had been used in any former experiments.

I have not judged it necessary to make any more experiments, with the ligature on the limb, because the numerous experiments of the Abbé Fontana on the ticunas, coincide in their results with those which have just been detailed, and fully establish the efficacy of the ligature in preventing the action of the poison. It is not to be wondered at, that the ligature should sometimes fail in its effects, since these must evidently depend on the degree in which the circulation is obstructed, and on the length of time during which the obstruction is continued.

There can be little doubt that the woorara affects the brain, by passing into the circulation through the divided vessels. It is probable that it does not produce its effects until it enters the substance

of the brain, along with the blood, in which it is dissolved; nor will the experiments of the Abbé Fontana, in which he found the ticunas produce almost instant death when injected into the jugular vein of a rabbit, be found to militate against this conclusion, when we consider how short is the distance, which, in so small an animal, the blood has to pass from the jugular vein to the carotid artery, and the great rapidity of the circulation; since in a rabbit under the influence of terror, during such an experiment, the heart cannot be supposed to act so seldom as three times in a second.

I have made no experiments to ascertain through what medium other poisons when applied to wounds affect the vital organs, but from analogy we may suppose that they enter the circulation through the divided blood-vessels.

The facts already related led me to conclude that alcohol, the essential oil of almonds, the juice of aconite, the oil of tobacco, and the woorara, occasion death simply by destroying the functions of the brain. The following experiment appears fully to establish the truth of this conclusion.

Exp. 30.—The temperature of the room being 58° of Fahrenheit's thermometer, I made two wounds in the side of a rabbit, and applied to them some of the woorara in the form of paste. In seven minutes after the application, the hind legs were paralysed, and in fifteen minutes respiration had ceased, and he was apparently dead. Two minutes afterwards the heart was still beating, and a tube was introduced through an opening into the trachea, by means of which the lungs were inflated. The artificial respiration was made regularly about thirty-six times in a minute.

At first, the heart contracted one hundred times in a minute.

At the end of forty minutes, the pulse had risen to one hundred and twenty in a minute.

At the end of an hour, it had risen to one hundred and forty in a minute.

At the end of an hour and twenty-three minutes, the pulse had fallen to a hundred, and the artificial respiration was discontinued.

At the commencement of the experiment, the ball of a thermometer being placed in the rectum, the quicksilver rose to one hundred degrees; at the close of the experiment it had fallen to eighty and a half.

During the continuance of the artificial respiration, the blood in the femoral artery was of a florid red, and that in the femoral vein of a dark colour, as usual.

It has been observed by M. Bichat, that the immediate cause of death, when it takes place suddenly, must be the cessation of the functions of the heart, the brain, or the lungs. This observation may be extended to death under all circumstances. The stomach, the liver, the kidneys, and many other organs, are necessary to life, but their constant action is not necessary; and the cessation of their functions cannot therefore be the immediate cause of death. As in this case the action of the heart had never ceased; as the circulation of the blood was kept up by artificial respiration for more than an hour and twenty minutes after the poison had produced its full effects; and as during this time the usual changes in the colour of the blood took place in the lungs; it is evident that the functions of the heart and lungs were unimpaired: but that those of the brain had ceased, is proved by the animal having continued in a state of complete insensibility; and by this circumstance,

that animal heat, to the generation of which I have formerly shown the influence of the brain to be necessary, was not generated.

Having learned that the circulation might be kept up by artificial respiration for a considerable time after the woorara had produced its full effects, it occurred to me that in an animal under the influence of this or of any other poison that acts in a similar manner, by continuing the artificial respiration for a sufficient length of time after natural respiration had ceased, the brain might recover from the impression which the poison had produced, and the animal might be restored to life. In the last experiment, the animal gave no sign of returning sensibility; but it is to be observed, 1. That the quantity of the poison employed was very large. 2. That there was a great loss of animal heat, in consequence of the temperature of the room being much below the natural temperature of the animal, which could not therefore be considered under such favourable circumstances as to recovery, as if it had been kept in a higher temperature. 3. That the circulation was still vigorous when I left off inflating the lungs, and therefore it cannot be known what would have been the result, if the artificial respiration had been longer continued.

Exp. 31.—A wound was made in the side of a rabbit, and one drop of the essential oil of almonds was inserted into it, and immediately the animal was placed in a temperature of 90°. In two minutes he was under the influence of the poison. The usual symptoms took place, and in three minutes more respiration had ceased, and he lay apparently dead, but the heart was still felt beating through the ribs. A tube was then introduced into one of the nostrils, and the lungs were inflated about thirty-five times in a minute. Six minutes after the commencement of artificial respiration, he moved his head and legs, and made an effort to breathe. He then was seized with convulsions, and again lay motionless, but continued to make occasional efforts to breathe. Sixteen minutes after its commencement, the artificial respiration was discontinued. He now breathed spontaneously seventy times in a minute, and moved his head and extremities. After this, he occasionally rose, and attempted to walk. In the intervals he continued in a dozing state; but from this he gradually recovered. In less than two hours he appeared perfectly well, and he continued well on the following day.

The inflating the lungs has been frequently recommended in cases of suffocation, where the cause of death is the cessation of the functions of the lungs: as far as I know, it has not been before proposed in those cases, in which the cause of death is the cessation of the functions of the brain. It is probable, that this method of treatment might be employed with advantage for the recovery of persons labouring under the effects of opium, and many other poisons.

III. GENERAL CONCLUSIONS.

The experiments which have been detailed lead to the following conclusions.

1. Alcohol, the essential oil of almonds, the juice of aconite, the empyreumatic oil of tobacco, and the woorara, act as poisons by simply destroying the functions of the brain; universal death taking place, because respiration is under the influence of the brain, and ceases when its functions are destroyed.

2. The infusion of tobacco when injected into the intestine, and the upas antiar when applied

to a wound, have the power of rendering the heart insensible to the stimulus of the blood, thus stopping the circulation; in other words, they occasion syncope.

3. There is reason to believe that the poisons, which in these experiments were applied internally, produce their effects through the medium of the nerves without being absorbed into the circulation.

4. When the woorara is applied to a wound, it produces its effects on the brain, by entering the circulation through the divided blood-vessels; and, from analogy, we may conclude that other poisons, when applied to wounds, operate in a similar manner.

5. When an animal is apparently dead from the influence of a poison, which acts by simply destroying the functions of the brain, it may, in some instances at least, be made to recover, if respiration is artificially produced, and continued for a certain length of time."

POISON-ASH, in botany. See **AMYRIS** and **RHUS**.

POISON-NUT, in botany. See **STRYCHNOS**.

POISON-OAK, in botany. See **RHUS**.

POISON-TREE, in botany. See **RHUS**.

To POISON. v. a. (from the noun.) 1. To infect with poison (*Roscommon*). 2. To attack, injure, or kill by poison given (*Macca-bees*). 3. To corrupt; to taint (*Shakspeare*).

POISONER. s. (from *poison*.) 1. One who poisons (*Dryden*). 2. A corrupter (*South*).

POISONOUS. a. (from *poison*.) Venomous; having the qualities of poison (*Cheyne*).

POISONOUSLY. ad. Venomously (*Sou.*).

POISONOUSNESS. s. (from *poisonous*.) The quality of being poisonous; venomousness.

POISSON (Raymond), son of a mathematician at Paris, was patronized by the duke of Crequi; but quitted the profession of a courtier for the stage. He was afterwards noticed by Lewis XIV. and died at Paris, 1690. He wrote the *Baron de la Crasse*—*The Good Soldier*, comedies of one act—*Lubin*—*The Fool of Quality*, &c.

POISSON (Paul), son of the preceding, was eminent also as a comedian. He died at St. Germain-en-Laye, 1735, aged 77. His son Philip was likewise a comedian of celebrity, who died at Paris, 1743, aged 60. He was author of six comedies, 2 vols. 12mo.

POISSONNIER (Peter Isaac), a physician of Dijon, one of the first who read chemical lectures at Paris. He was sent by the court, at the request of Elizabeth, empress of Russia, who wished for the advice of an eminent physician, and on his return he was made first physician to the army, &c. and obtained a pension of 12,000 livres. The revolution sent him with all his family into confinement; but he was restored to liberty after the fall of Robespierre, and died 1797, aged 79. He wrote treatises on the means of rendering sea water potable—on the fevers of St. Domingo—on the diseases of seamen, 2 vols. 8vo.—abridgment of anatomy, 2 vols. 12mo.

POISSY, a town of France, in the department of Seine and Oise, seated near the forest of St. Germain, 15 miles N.W. of Paris.

POITIERS, a town of France, capital of

the department of Vienne, and a bishop's see. Its population is not in proportion to its extent; for it includes a number of gardens and fields within its circuit. It has several Roman antiquities, particularly an amphitheatre, partly demolished; and a triumphal arch, which serves as a gate to the great street. Here, in 1356, Edward the black prince gained a victory over the French, taking prisoners king John and his son Philip, whom he brought to England. The principal manufactures are stockings, woollen caps, gloves, and combs. It is seated on a hill, on the river Clain, 52 miles S.W. of Tours, and 120 N. by E. of Bourdeaux. Lon. 0. 21 E. Lat. 46. 35 N.

POITOU, a late province of France, bounded on the N. by Bretagne, Anjou, and Touraine, E. by Touraine, Berry, and Marche, S. by Angoumoise, Saintonge, and Aunis, and W. by the Bay of Biscay. It is fertile in corn and wine, and feeds a great number of cattle, particularly mules. It now forms the three departments of Vendée, Vienne, and Two Sevres.

POITREL. *s.* (*poictrel*, French.) 1. Armour for the breast of a horse (*Skinner*). 2. A graving tool (*Ainsworth*).

POIZE. *s.* (*poids*, French.) 1. Weight; force of any thing tending to the centre (*Spenser*). 2. Balance; equipoize; equilibrium (*Bentley*). 3. A regulating power (*Dryden*).

To POIZE. *v. a.* (*peser*, French.) 1. To balance; to hold or place in equiponderance (*Sidney*). 2. To load with weight (*Dryden*). 3. To be equiponderant to (*Shakspeare*). 4. To weigh (*South*). 5. To oppress with weight (*Shakspeare*).

POKE. *s.* (*pocca*, Saxon; *poche*, French.) A pocket; a small bag (*Drayton*).

To POKE. *v. a.* (*poka*, Swedish.) To feel in the dark; to search any thing with a long instrument (*Brown*).

POKER. *s.* (from *poke*.) The iron bar with which men stir the fire (*Swift*).

As many casualties occur from negligence, or imprudence, in leaving pokers in the fire, we shall state the following expedient, by which they may in future be prevented. It consists simply in welding or soldering a small cross of iron (projecting about an inch and a half each way), immediately above the square part of the poker called the bit. By this contrivance, the instrument cannot be thrust into the fire farther than such bit; a circumstance of some advantage, where fire-irons are highly polished. Besides, if the burning coals should yield, or any other accident happen, so as to cause the poker to slide out, it will probably be arrested on the edge of the fender. And though it should fall on the hearth or carpet, neither of these will sustain any material injury; as the heated part, or bit, will be elevated several inches above the floor.

POKING-STICK. *s.* An instrument anciently made use of to adjust the plaits of the ruffs which were then worn (*Shakspeare*).

POLA, a strong seaport of Istria, and a

bishop's see. Here are large remains of a Roman amphitheatre and a triumphal arch. It is seated on a mountain, near a bay of the gulf of Venice, 38 miles S. of Capo d'Istria. Lon. 14. 9 E. Lat. 45. 13 N.

POLACRE, a ship with three masts, usually navigated in the Levant and other parts of the Mediterranean. These vessels are generally furnished with square sails upon the main-mast, and lateen sails upon the fore-mast and mizen-mast. Some of them, however, carry square sails upon all the three masts, particularly those of Provence in France. Each of their masts is commonly formed of one piece, so that they have neither top-mast nor top-gallant-mast; neither have they any horses to their yards, because the men stand upon the top-sail-yard to loose or furl the top-gallant-sail, and on the lower-yard to reef, to loose, or furl, the top-sail, whose yard is lowered sufficiently down for that purpose.

POLAEDRASTYLA, in natural history, is the name of a genus of crystals, derived from the Greek *πολυς*, many, *εδρα*, sides, the primitive particle of *a*, not, and *στυλος*, a column; and means a crystal with many planes, and without a column.

The bodies of this genus are crystals of two octangular pyramids, with the bases joined, the whole body consisting of sixteen planes. Of this genus there are only two species known: 1. A brown kind with short pyramids, found in great plenty in Virginia on the sides of hills; and, 2. A colourless one, with longer pyramids. This has yet been found only in one place, which is the great mine at Gossalaer, in Saxony.

POLAND, a country of Europe, bounded on the N. by Prussia, Courland, Livonia, and Russia, W. by the Baltic, Brandenburg, and Silesia, S. by Hungary and Moldavia, and E. by Russia and the territories wrested by that power from the Turks. It is divided into four principal parts, Great Poland, Little Poland, Red Russia, and Lithuania; each of which is subdivided into palatinates, or provinces. Poland has now no political existence as a nation, being divided among the neighbouring states. The government was monarchical and aristocratical; all the acts of state being in the name of the king and republic of Poland. The king was the only elective sovereign in Europe; being chosen by a general diet summoned by the archbishop of Gnesna, as chief of the republic during the interregnum. This circumstance proved the source of great calamities; for, on the demise of every sovereign, the country was generally involved in a war, between contending factions, respectively supported by foreign powers. In 1772, a partition of this country, projected by the king of Prussia, was effected by that monarch, in conjunction with the empress of Russia and the emperor of Germany. By this partition, one-third of the country was wrested from the republic, the diet being compelled by a foreign force to make and to ratify this important cession. The three petitioning powers, moreover, forcibly effected a great

change in the constitution. In 1791, however, the king and the nation in concurrence almost unanimously, and without any foreign intervention, established another constitution. By this the evils of an elective monarchy were avoided, the throne being declared hereditary in the house of Saxony. The rights and privileges of all orders in the republic (the king, the nobles, the citizens, and the peasants) were alike equitably consulted; and it seemed to be formed agreeably to the universal wish of the nation. A few of the nobility, however, discontented at the generous sacrifice of some of their privileges, repaired to the court of Russia; and their representations concurring with the ambitious views of the empress, she sent an army into Poland, under pretext of being guarantee of the constitution of 1772. Her interference was too powerful to be resisted; and this new constitution was overthrown. But the principal object for which the Russian army entered Poland was not yet attained. The empress had planned, in conjunction with the king of Prussia, a second partition of this country, which took place in 1793. Such multiplied oppressions at last roused the spirit of the nation. General Kosciuszko appeared in 1794 at the head of a Polish army, to assert the independency of his country, and to recover the provinces wrested from it. He was successful at first against the king of Prussia; but was defeated, and taken prisoner in the sequel by the Russians, who soon after took the capital, Warsaw. The king formally resigned his crown at Grodno, in 1795, and was afterwards removed to Petersburg, where he remained a kind of state prisoner, till his death in 1798. The whole of the country was divided among the three partitioning powers. Austria had Little Poland, and the greatest part of Red Russia and Podolia, which is now called the kingdom of Galicia; Prussia had Great Poland, Polish Prussia, a small part of Lithuania, and Polachia; and Russia had Samogitia, the remainder of Lithuania, Volhinia, and Podolia. The towns of Poland are for the most part built with wood; and the villages consist of mean cottages, or huts. The country is so fertile in corn in many places that it supplies Sweden and Holland with large quantities, and it has extensive pastures. Peat, ochre, chalk, belemnites, agate, chalcidony, cornelians, onyxes, jasper, rock-crystals, amethysts, garnets, topazes, sapphires, and even rubies and diamonds are found in Poland; also talc, spar, lapis calaminaris, coal, iron, lead, and quicksilver. Here is much leather, fur, hemp, flax, saltpetre, alum, manna, honey, and wax; and there are mines of salt, of a great depth, out of which is dug rocksalt. Horses are numerous, very strong, swift, and beautiful; and horned cattle are bred in such numbers, that above 80,000 are driven every year out of the country. The principal rivers are the Dnieper, Vistula, Bug, Niemen, Dniester, and Bog.

POLAR. *a. (polaire, French; from pole.)* Found near the pole; lying near the pole; issuing from the pole (*Prior*).

POLAR STONE, in helminthology. See **ECHINUS**.

POLARITY, the quality of a thing considered as having poles, or a tendency to turn itself into one certain posture; but chiefly used in speaking of the magnet. See **MAGNETISM**.

POLARY. *a. (polaris, Lat.)* Tending to the pole; having a direction toward the poles (*Brown*).

POLE. *s. (pole, Saxon)* 1. A long staff (*Bacon*). 2. A tall piece of timber erected (*Shakspeare*). 3. A measure of length containing five yards and a half (*Spenser*). 4. An instrument of measuring (*Bacon*).

POLE, in astronomy, one of the extremities of the axis, on which the sphere revolves. These two points, each ninety degrees distant from the equinoctial or equator, are by way of eminence called the poles of the world; and the extremities of the axis of the artificial globes, corresponding to these points in the heavens, are termed the poles thereof. See **GLOBE**.

POLE, in geography, one of the points on which the terraqueous globe turns: each of them being 90 degrees distant from the equator, and, in consequence of their situation, the inclination of the earth's axis, and its parallelism during the annual motion of our globe round the sun, having only one day and one night throughout the year.

It is remarkable, that though the north in Hebrew, Greek, Latin, and French, derives its name from gloom, obscurity, and darkness, the poles enjoy more light than any other part of the world. The ancients believed the north to be covered with thick darkness; Strabo tells us, that Homer, by the word *σέρος*, which properly signifies obscurity or darkness, meant the north; and thus Tibullus, speaking of the north, says, *Illic et densa tellus absconditur umbra*. The Arabians call the northern ocean the dark sea; the Latins gave the name of Aquilo to the north wind, because *aquilus* signifies black; and the French call it *la bise*, from *bis*, black. According to the ancients, the Cimmerians lived in darkness, because they were placed near the north. But all this is mere prejudice; for there are no places in the world that enjoy light longer than the arctic and antarctic poles; and this is accounted for by considering the nature of twilight. In the torrid zone, and under the line, night immediately follows the setting of the sun, without any sensible twilight; whereas the twilight begins and continues increasing in proportion as places are distant from the equator or approach the pole. To this long twilight we must add the aurora borealis, which appears in the northern regions, Greenland, &c. in clear nights, at the beginning of the new moon, casting a light equal to that of full moon. (See Gassendi in the Life of Peyresc, book iii. and La Perere in his Account of Greenland.) There is also long moonlight at the poles during winter. (See **ASTRONOMY**.) But though there is really more light in the polar regions than elsewhere; yet owing to the

obliquity with which the rays of the sun fall upon them, and the great length of winter night, the cold is so intense, that those parts of the globe that lie near the poles have never been fully explored, though the attempt has been repeatedly made by the most celebrated navigators.

POLE, in spherics, a point equally distant from every part of the circumference of a great circle of the sphere, as the centre is a plane figure; or it is a point of ninety degrees distant from the plane of a circle, and in a line, called the axis, passing perpendicularly through the centre. The zenith and nadir are the poles of the horizon; and the poles of the equator are the same with those of the sphere.

POLES OF THE ECLIPTIC, are two points on the surface of the sphere, $23^{\circ} 30'$ distant from the poles of the world, and 90° distant from every part of the ecliptic.

POLES, in magnetics, are two points of a loadstone, corresponding to the poles of the world; the one pointing to the north, the other to the south. See **MAGNETISM**.

POLE, or **POLAR STAR**, is a star of the second magnitude, the last in the tail of ursa minor. Its longitude Mr. Flamsteed makes $24^{\circ} 14' 41''$; its latitude, $66^{\circ} 4' 11''$. The nearness of this star to the pole, whence it happens that it never sets, renders it of vast service in navigation, &c. for determining the meridian line, the latitude, &c.

POLE (Reginald), a cardinal and kinsman to Henry VII. was bred at Corpus Christi college, Oxford, and made dean of Exeter. According to Camden, he was born in 1500, at Stoverton castle, in Worcestershire, and was instructed in the Carthusian monastery at Shene, near Richmond, in Surry. At twelve he became a student at Magdalen college, Oxford. His royal relation conferred several favours on him, designing to raise him to the highest dignities in the church; and after he had taken the suitable degrees, allowed him a large pension to enable him to travel into Italy. Henry the Eighth's dispute with the holy see occasioned Pole to stay out of England, and to write a piece called *Pro unitate Ecclesiastica*, for which and refusing to return when ordered, his pension was taken away, and himself attainted. The pope and emperor compensated the loss of his church preferments; the former had made him cardinal in 1536, and sent him as nuncio both to France and Flanders. Under Mary he returned to England in 1554, and was made archbishop of Canterbury. He died at Lambeth palace in 1558, sixteen hours after the death of the queen. Though zealously attached to all the superstitions of his church, and to the pretensions of the papacy, he was a man of amiable manners, mild disposition, great learning, and a patron of men of letters.

To POLE. *v. a.* (from the noun.) To furnish with poles (*Mortimer*).

POLEAXE. *s.* (*pole* and *axe*.) An axe fixed to a long pole (*Howell*).

POLE-CAT, a species of weasel, partaking in some degree of the figure and propensities of

the martin and the ferret: it is smaller than the first, and considerably larger than the second; is an inhabitant of the bushy coverts in the neighbourhood of lonely farm-houses; to the poultry, eggs, and dove-houses of which they are constant and destructive enemies: The effluvia, or rather stench, arising from their bodies is so truly offensive, that it has long since laid the foundation of the well-known proverbial expression of "stinking like a pole-cat." See **MUSTELA**.

PÖLEDAVVY. *s.* A sort of coarse cloth.

POLEMICAL. **POLE'MIC**. *a.* (*πολεμικος*.) Controversial; disputative (*South*).

POLEMIC. *s.* Disputant; controvertist (*Pope*).

POLEMONIUM. Greek valerian. Jacob's ladder. Calyx five-parted; stamens standing on five valves closing the bottom of the tube; stigma three-cleft; capsule three-celled, superior. Five species; one of our own mountains, the rest natives of the Cape, or of America. The two following are cultivated:

1. *P. cœruleum*. Common polemonium, or Greek valerian. Leaves pinnate; flowers erect; calyx longer than the tube of the corol; corol blue, between bell and wheel-shaped. Found wild on our mountains. There is a variety with woolly calyxes.

2. *P. reptans*. Creeping polemonium. Leaves pinnate, with seven leaflets; flowers light-blue, terminal, nodding. A native of Virginia. Both may be increased by seeds, or parting the roots.

POLEMSCOPE, in optics, a kind of reflecting perspective glass invented by Hevelius, who commends it as useful in sieges, &c. for discovering what the enemy is doing, while the spectator lies hid behind an obstacle.

POLENBERG (Cornelius), a Dutch painter, born at Utrecht in 1586. His best pieces are of the cabinet size, as he could not rise to the execution of large figures. Being invited by Charles I. he came over to England, and though greatly encouraged, he chose to return to his native country, where he died in 1660.

POLERON. See **POOLORON**.

POLESIA, a name given to the palatinate of Brzescia, in Lithuania.

POLESINO-DI-ROVIGO, a province of Italy, in the republic of Venice; bounded on the N. by the Paduan, on the S. by the Ferrarese, on the E. by the Dogado, and on the W. by the Veronese. It is 42 miles long and 17 broad, and is fertile in corn and pastures. Rovigo is the capital.

POLETÆ were ten magistrates of Athens, who, with three that had the management of money allowed for public shows, were empowered to let out the tribute-money and other public revenues, and to sell confiscated estates; all which bargains were ratified by their president, or in his name. They were by their office also bound to convict such as had not paid the tribute called *μεσιςιον*, and sell them in the market by auction. The market where these wretches were sold was called *πωλησιον τι μεσιςιον*.

POLICANDRO, an island in the Archi-

pelago, one of the Cyclades, 20 miles in circumference. Here are a few villages, a castle, and a harbour; but it consists in general of barren rocks and mountains. It lies between Milo and Paros. Lon. 25. 31 E. Lat. 36. 32 N.

POLICASTRO, a decayed town of Naples, in Principato Citeriore, with a bishop's see. It is seated on a gulf of the same name, 68 miles S.E. of Naples. Lon. 15. 40 E. Lat. 40. 15 N.

POLICE. *s.* (French.) The regulation and government of a city or country, so far as regards the inhabitants.

POLICED. *a.* (from *police*.) Regulated; formed into a regular course of administration (*Bacon*).

POLICY. *s.* (πολιτια; *politia*, Latin.) 1. The art of government, chiefly with respect to foreign powers. 2. Art; prudence; management of affairs; stratagem (*Shakspeare*). 3. (*poliça*, Spanish.) A warrant for money in the public funds; a ticket.

POLICY OF INSURANCE, or ASSURANCE OF SHIPS, is a contract or convention whereby a person takes upon himself the risks of a sea-voyage, obliging himself to make good the losses and damages that may befall the vessel, its equipage, tackle, victualling, lading, &c. either from tempests, shipwrecks, pirates, fire, war, reprisals, in part or in whole; in consideration of a certain sum of seven, eight, or ten per cent. more or less according to the risk run; which sum is paid down to the assurer by the assured upon his signing the policy. See **INSURANCE**.

POLIDORO DA CARAVAGGIO, an Italian painter, so called from the name of a village in the duchy of Milan, in which he was born in 1495. He was a day-labourer at the Vatican, and prepared stucco for the painters, but having solicited them to teach him the rules of designing, he made such a rapid improvement that he became superior to any in the Roman school, at least in chiaro scuro. Few of the public buildings of Rome are without some of his pieces. He was most basely assassinated in 1543, by his valet, for the sake of his money.

POLIGNAC (Melchior de), a cardinal of France, born of an ancient family at Puy in 1662. His professor instructed him in the system of Aristotle, but he embraced the new doctrines of Des Cartes. He was sent by Louis XIV. as ambassador extraordinary to Poland, where, after the death of Sobieski, he formed a project of obtaining the succession for the prince of Conti. He was plenipotentiary during the congress at Utrecht, at which time Clement XI. created him a cardinal; Louis XV. chose him for his minister at Rome, where he resided till 1732. He died in 1741, leaving behind him a Latin poem in MS. called *Anti-Lucretius*, seu de Deo et Natura, a work suggested by a conversation between the author and Mr. Bayle in Holland, and printed in 1749.

POLIGNANO, a populous town of Naples, in Terra di Bari, with a bishop's see.

It is seated on a craggy rock, near the sea, 16 miles E. of Bari. Lon. 17. 24 E. Lat. 41. 25 N.

POLIGNI, a town of France, in the department of Jura, seated on a rivulet, 32 miles S.W. of Besançon. Lon. 5. 55 E. Lat. 46. 50 N.

POLINA, an ancient town of Albania, with a Greek archbishop's see. It was formerly a considerable place, but is now almost in ruins, and is 12 miles S. of Durazzo. Lon. 19. 20 E. Lat. 41. 42 N.

POLINGHERA, a town of Piedmont, situated on the Po, 13 miles S. of Turin. Lon. 7. 45 E. Lat. 44. 52 N.

POLIOSIS. (from πολιος, white.) Greyhead-
edness.

To POLISH. *v. a.* (*polio*, Lat. *polir*, Fr.) 1. To smooth; to brighten by attrition; to gloss (*Granville*). 2. To make elegant of manners (*Milton*).

To POLISH. *v. n.* To answer to the act of polishing; to receive a gloss (*Bacon*).

POLISH. *s.* (*poli*, *polissure*, French.) 1. Artificial gloss; brightness given by attrition (*Newton*). 2. Elegance of manners (*Addison*).

POLISH GAME, or POLISH DRAUGHTS. From the original, or common game of draughts, which is played upon a table containing 64 squares, and with 24 men, half white, and half black, this game differs in being played upon a table containing 100 squares, and with 40 men; and also in the increased powers it gives to the men and to the kings. In the original game a man moves, and can take forward only, and a king moves from square to square, and takes only the adversary's piece or pieces near him: in the new game, a man, in addition, takes backwards, and a king moves to any square in the line, and takes the adversary's pieces near, or far from him; all which is according to certain rules which we shall explain and exemplify from Mr. Pohlman's abridgment and translation of M. Manoury's highly esteemed French treatise upon this game; this able and accurate translator having allowed us the use of his book for the present purpose.

The origin of the Polish game of draughts does not appear to have been very decidedly ascertained; but it is supposed by M. Manoury to have commenced at Paris, in the year 1720 or 1721; and is by him attributed to two players, who were extremely skilled in the original game; one of them a French officer, and the other a Polish nobleman; whence the title of the new game may be ascribed to French courtesy, especially as it was not known in Poland for many years subsequently. The circumstance is thus related:—

“A French officer of rank, who then belonged to the regent's establishment, was frequently in the habit of playing the original game of draughts, at his apartments in the palace royal, with a Polish nobleman. One day as they were playing together, there appeared in their game a particular situation, which gave rise to an observation from the officer; he pointed out to the nobleman a fine stroke which might be made, if the laws of the game allowed the men to take backwards, like the kings. The Polish nobleman, after an attentive examination, coincided with his friend; but observed, in his turn, how much finer a stroke might

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be made if the draught board, instead of eight lines, had ten, and instead of four black and white squares on each line, it had five; which he immediately demonstrated by sketching upon a piece of paper a table suitable to the purpose. A few days afterwards the nobleman having caused a draught board to be made according to the above plan, as also forty draught men, black and white, returned with the same to his friend, and shewed him a plan he had drawn up as to the movements, and the regulations under which he proposed to establish the new game. And several meetings having been devoted to the examination and arrangement of the whole scheme, the result was the present game, which for awhile was confined to some of their mutual friends, and after some time became generally known under the title of the Polish game of draughts."

The death, in the West Indies, of a celebrated player at this game, of the name of Laclef, who was thoroughly acquainted with every thing that appertained to it, from its commencement, is adverted to by M. Manoury, as the cause which prevented the above narrative from being more complete. But for this circumstance, and the loss of his curious and scientific notes, the history, it is added, would have been perfect, and the game much better illustrated. At present M. Manoury's treatise is considered as the constitution of the Polish game, in the same manner as the work published by M. Pierre Mallet, French royal engineer, and professor of mathematics, in 1668, is that of the original game of draughts.

It is related by M. Manoury, that among the earliest players who were seen to play publicly at the Polish game, was a descendant of the celebrated traveller, Tavernier of Geneva, who played at the coffee-house, Café du Commerce, Place Dauphine, in 1727. About the same period this game began to be played also at the Hotel de Soissons, at the Café de l'Opera, Rue St. Honoré, Quai de l'Ecole, and at some other public places at Paris, while the old game gradually disappeared.

From its greater variety, the Polish game of draughts has long been, and continues to be played in preference to the old game, throughout France, and also in most other parts of the continent. As a game in which chance has no concern, it stands next to chess, and is readily embraced by persons who find the old game of draughts too limited, and the game of chess demanding too much study.

Of great players at the Polish game of draughts, M. Manoury instances the before-mentioned Laclef as a wonderful proficient; for though less distinguished for brilliancy of strokes than Marchand, another player of celebrity, he was more shrewd and acute in seasonably exchanging man for man, gaining advantage of situation and move, and straitening, perplexing, and out-manceuvring his adversary. M. Manoury, who kept a coffee-house which was frequented by skilful players, enraptured as he appears to have been with the game, was hardly inferior to either. The celebrated Philidor was partial to the game, and a good player at it; but it is said he could not stand against players of this rank; he therefore the more willingly devoted all his attention to chess.

To explain the mode in which the Polish game of draughts is played, we shall suppose the reader to have before him a square board or piece of paper, divided into 100 square spaces by means of ten parallel lines at equal distances in one direction, intersecting ten parallel lines at equal

distances in the other; these square spaces being painted alternately black and white as in common draughts: the upper line beginning with a black and closing with a white space, and every white space being numbered in succession, 1, 2, 3, 4, 5, for the first line, 6, 7, 8, 9, 10 for the second, and so on in succession to the last space in the tenth line which will have the number of 50: the first number or 1 being the first white space on the left hand of the uppermost line, and the last number or 50 being the last white space on the lowermost.

This being premised and provided for, the rules he is then to attend to are as follows, the cases being all drawn up in reference to the different squares numbered as now directed.

1. The table, or draught board containing 100 squares, 50 of which are white, and 50 black, is placed with an upper white corner towards the right hand; 20 white men and 20 black men are then placed on the white squares in opposite directions, which white squares are those numbered 1 to 20, and 31 to 50.

2. Each player plays alternately.

3. A man moves obliquely forward one square at a time, viz. from one white square to another white square; and having one or more pieces to take, he moves over two, four, six, or more squares, according to the number of pieces that are in a situation to be taken, and he may, in such case, move backwards.

4. A piece is in a situation to be taken if it stand immediately close to an adversary's man, provided there be an empty square next to the piece; in which case the adversary's man takes the piece, after placing his own man upon the empty square.

5. In like manner, if there be several pieces in such a situation, having respectively between each a vacant square, the adversary's man takes over all of them, and places himself on the last vacant square.

6. But he is not to take off any of the captive pieces until he has rested upon the last square, as far as he can go.

7. Neither can a man nor a king, in the execution of a stroke, move more than once over any of the captured pieces.

8. If by oversight or otherwise, any of the captured pieces be not taken off, but be left on the board, there is not only no redress for your not having taken off as many as you ought, but the capturing piece itself becomes forfeited, or, as it is commonly called, huffed, at the option, however, of the adversary. The act of huffing is not reckoned as a move.

9. You may decline huffing an adversary's piece, and compel him to take; and you may delay doing either.

10. If several of the adversary's pieces happen to be in situations to be taken by one or more of your pieces, it is necessary that you do take in the direction which secures most captives, taking preferably a king to a man. The adversary has the option to compel you to do this, or subject you to forfeit the man or king with which you should have taken.

11. When a man is arrived on any of the five squares in the lines which confer the right of being crowned, another of his own colour is placed upon him, and the compound piece is then called a king.

12. The lines which confer this right contain the squares numbered 1, 2, 3, 4, 5, and those

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numbered 46, 47, 48, 49, 50; so that if the white men be placed on and play from the squares 31 to 50, they go to king on 1, 2, 3, 4, 5; and the black men consequently on 46, 47, 48, 49, 50.

13. If in the course of taking his adversaries, a man happens only to pass on one or more of the squares in these lines, without dwelling thereon, he is not therefore to be crowned, as this is lawful only in the event of the stroke terminating, or leaving him upon or in possession of one of these squares.

14. A king is not confined to move from square to square, but may move from one end of an oblique line to another, if the passage be free; that is, if there be none of his own colour in the way, nor of the adversaries, provided such adversaries are not in a situation to be taken. And the king having adversaries to take, may at once traverse over several squares, provided those squares are empty; or over squares occupied by the adversary's pieces, if those pieces are in a situation to be taken; so that a king often turns to the right and to the left, and makes almost the whole range of the board.

15. When, towards the conclusion of the game, two equal players happen to be left, the one with three kings, and the other with one king only on the board; if the single king be upon the centre diagonal line, and there be no immediate stroke in view, the game, after one or two moves, should be relinquished, and considered as a drawn game (as courtesy, in this case, requires that the player who has the three kings should not avail himself of the 20 moves described in next article).

16. But if the single king do not occupy the said centre diagonal line, as there are, in consequence, several schemes whereby the three kings may succeed in entrapping him; it is usual to grant for this purpose to the player who has the three kings, to play on till twenty moves shall have been respectively played; when, if he do not so succeed, the game is pronounced a drawn game.

17. When, towards the end of a game, it happens that only a king, against a king and two men, or two kings and one man, are remaining on the board, the player having the solitary king, may compel the adversary to have his man or men crowned on the spot, in order to lose no time in beginning to count the aforesaid twenty moves.

18. If at any time you make a false move, it depends upon the adversary whether it shall be recalled.

19. If you touch a piece, unless for the sake of arranging the pieces, the adversary may compel you to play it if it can be played.

EXAMPLES EXPLANATORY OF SOME OF THE FOREGOING RULES.

I. Situations explanatory of rules 3, 4, 5, 6, 8.

White, 29, 31, 38, 39, 43, 48.

Black, 11, 12, 14, 22, 32, 15.

According to the 3d rule, the white man 38, moves over several squares in taking the black men, 32, 22, 12, and 11, moving backwards in taking No. 11.

According to 4th and 5th rules, the white man 38, takes the black men 32, 22, 12, and 11, because there is between each an empty square, and places himself upon the square 16, as being the last empty square.

According to rule 6th, the player who has the white men does not take off the black men, until his man is placed and rested on the square 16, and

he does not begin to place his man 38 on square 16, and then take off the black man 32, nor continue to place his man on the square 18, and then take off the black man 22, and so on.

According to rule 8th, supposing the player who has the white, after having placed his man on the square 16, happens to take off only some of the black men, leaving, for instance, on the board, the black man 12, or even also the black man 32, he cannot, without the consent of the other player, take the men so left; and if the other player do not consent, not only must these two men remain on the board, but the player of the black men has a right to forfeit by taking off the board the white man 38, for not taking off as many as he ought; and it is to be observed, that one player can always force, if he pleases, the other to play correctly.

II. Explanatory of rule 7.

White, 27, 32, 33, 37, men—43, a king.

Black, 3, 4, 9, 19, men—10, 13, kings.

The white man 27 moves to 22. The black king 13, who has four pieces to take, is obliged to place himself on the square 28, because he is stopped by the white man 32, which cannot be taken off till the king has so placed himself. So that the white man 32, who is, in consequence, immediately behind the black king 13, now placed on 28, takes him, and also two pieces, and goes to king on square 5.

III. Explanatory of rule 10.

White, 31, 35, 38, 42, 43, 48.

Black, 5, 14, 20, 21, 22, 23, 30, 32.

Here there are several black men in a situation to be taken; but the white man 38, is obliged, and may be compelled to take the black men 32, 22, and 23. But if the player of the white should happen to take only two men, either with the said man 38, or with 35; the player of the black may avail himself of the oversight, and take off the board as a forfeited piece, the said white man 38.

IV. Explanatory of rule 9.

White, 36, 37, 40, 49, 50.

Black, 6, 7, 12, 27, 35.

In this situation the player of the black happening to overlook that his man 35, ought to take the white man 40, pushes his man 12 on 17. The adversary, finding it more advantageous not to make forfeiture of the black man 35, for not taking, advances his man 37 on the square 31. The player of the black now seeing his danger, wishes to advance his man 17 on 22, but is prevented by the player of the white, who now compels the black man 35, to take the white man 40.

V. Explanatory of rule 10.

White, 31, 35, 38, 39, 43, 48, 49.

Black, 3, 5, 9, 20, 22, 30, men—32, a king.

The white having here to take, in one direction, a king and a man, and in the other two men, are to take in the former direction, as being the stronger. If the white were to take in the latter direction, the other player might make forfeiture of the man 38; or, if it suited him better, compel the white to take as he ought to do, the black king 32, and man 22.

VI. Explanatory of rule 13.

White, 34, 42, 43.

Black, 30.

It is seen that the black man 30, in taking the white men 34 and 43, arrives on the square 48, one of the five in the line which confer the right of being crowned to the black men; but here the

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black man cannot be crowned, as he does not remain on the square 48, but is obliged to pass on to take the white man 42, in consequence of which the stroke terminates, not on 48, but on 37. And if the black man were to stop on 48, taking only the adversary's men 34 and 43, he would be forfeited.

VII. *Explanatory of rule 16.*

White, 13, 25, 41, kings.

Black, 26, a king.

In this situation there had been 19 moves played by each player. The white continue and play the 20th move, by playing the king 13 on the square 8; the black king then takes the king 13, and places himself upon the square 4; here the 20 moves respectively made by each player are completed, and the white are in consequence not at liberty to move the king 41 on 14, whereby they otherwise would win the game.

Of the odds given at the game.—It is rare to find, even among first-rate players, any two exactly equal in their play; between them there is always some shade of difference, which again daily varies according to their disposition, and particular turn existing when they sit down to play. When in one of the players there is a decided superiority, the game is to be equalized by the odds which are given to the other player. If there be but a trifling difference between two players, the odds to be given by the superior to the inferior player, usually is to allow him to reckon every other game that he may succeed to draw, as a game won. Or, he may play upon perfect equality one game, and the next game the superior player may give a man, thereby playing with 19 men against 20. The difference being greater, the superior gives up to the inferior in every game a man. And if still greater, besides giving up a man, allows a drawn game to reckon as a game won. Lastly, there being still greater disparity, the odds are extended to two men: beyond this there is no proportion or amusement to either party.

Of the drawn game.—Between equal players either at this or the original game, if they play correctly, there are games neither won nor lost, and which are therefore denominated drawn games; a drawn game arises out of that advanced stage of this game in which each player has but one, two, or three pieces left, and so situated that one player cannot prevail over the other so as to win the game, and which is therefore relinquished, withdrawn, or a drawn game. Neither at the common game at draughts, nor at chess, does there appear to be practised any fixed time to determine when a game is to be considered as drawn. Such a regulation does not appear necessary, as applicable to liberal and discerning players, because they know when to leave off; but as it is desirable to include all sorts of players, this is provided for in the rules of the present game, whereby tedious players are prevented from unnecessarily prolonging a game. To those who are acquainted with the common game only, and to those who are beginners at this, it will appear strange that when three kings against one king are the only pieces remaining on the board, the game must necessarily be a drawn game; that is, if the single king be left on the board, in a fair, open situation, not in danger, and provided no faults are made in moving him about, it shall not be possible for the three kings to capture him, or to win the game. This may be considered as an imperfection of the game, but it could not be done away without at the same time depriving the game of innumerable beauties:

against such an objection, it should further be recollected that the rights of the individual are proportionably greater than at the common game, as no adversary's king or man can, in the Polish game, pass immediately behind him with impunity, in consequence of his being allowed to take both backwards and forwards. As many tolerable players and most beginners are not aware of the schemes whereby the solitary king is frequently captured by the other three, the following situations are given.

VIII. White, 46, a king.

Black, 13, 26, 27, kings.

This is the only kind of situation in which the three kings have any chance of capturing the single king, in possession of the centre diagonal line.

If the white king whose turn it is to play were to go to the end of the diagonal line, or be placed upon the squares 10 or 14, he would be lost, because the black would give two and take him; but it is very easy to avoid this or a like stroke, by placing the king in that direction of the line from which the intended exchange cannot be made; for instance, in the present situation, the white king has four squares to make choice of, and where he will be in safety, viz. 41, 37, 28, and 23. So easy is it therefore for a king who has the command of the centre diagonal line of the board to avoid being taken by the three kings, that after one or two moves the game should be given up as a drawn game. But if the three kings are in possession, or have the command of the centre diagonal line, the game should not by them be so readily discontinued, it being very possible that before the 20 moves allowed by rule 16 are expired, the single king may fall into one or other of the snares contained in the seven following situations.

IX. White, 46, 37, 27, kings.

Black, 11, a king.

The white king 27 is placed on the square 22. The black king then takes the two white kings, and is immediately retaken. The like stroke may be performed in other directions of the board.

Of the seven situations the present one, as most easily perceived, is the least resorted to for the capture of the single king; it being hardly to be expected that when the white kings are so placed, viz. 46, 37, 27, the black king should place himself upon such a square as No. 11.

X. White, 19, 27, 37, kings.

Black, 11, a king.

The white king 27 is placed on the square 22, and the black king must take two kings, and loses the game, whether he places himself upon either of the extremities of the centre diagonal line or not: if he does not, he is immediately retaken, and if he does, the remaining white king places himself upon the opposite extremity, whereby the black king cannot afterwards move without being taken. It happens sometimes that in taking the two kings, the black king, for the purpose of deception, is placed upon the last square but one of the extremity of the line; when the player of the white, in his anxiety, imagining the black king to be upon the last square, withdraws the white king to the other extremity of the line, and who consequently becomes forfeited for not taking, and the black wins.

XI. White, 18, 26, 28, kings.

Black, 20, a king.

The white king 18 is moved on the square 9.

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The black takes him, placing himself on the square 3. The white king 28 is then placed on 17; is taken by the black king, who is retaken by the remaining white king.

XII. White, 10, 36, 37, kings.

Black, 29, a king.

The white king 37 is placed on the square 42. The black king takes him. The white king 10 is then placed on the square 15, and the black king is locked up, or cannot move without being taken.

XIII. White, 32, 37, 41, kings.

Black, 15, a king.

The white king 41 is carried to square 47. The black retreats to square 4. The white king 32 moves on 38. The black is now lost wherever he goes; he can only go on the square 9, 13, 18, 22, or 36; if he place himself on either of the four first squares, the white king 37 is advanced on the diagonal line next to the black king, who must then take two, and be retaken by the remaining white king. And if the black king is placed on the square 36, the white 38 advances on the square 15; and as the black can play only on the diagonal line 36 and 4, the white king 37 is played on 31, which the black takes returning on the square 36. The white king then moves from 15 to 4; whereby the black king is shut up, or cannot move without being taken.

XIV. White, 1, 23, 49, kings.

Black, 17, a king.

The white king 49 moves on 44. The black takes. The white king 1 moves on square 6. The black goes on 45. The white king 6 returns on square 1, and the black must take and be retaken. Or, instead of this, the white king 23 might be placed on square 1, whereby the black king is shut up, or cannot move without being taken.

XV. White 9, 28, 35, kings.

Black, 21, a king.

The white king 9 moves on the square 25, and the black is lost wherever he goes. If he move on 26 or 12, the white king 35 moves on square 8, the black must take, placing himself on square 3. The white king 26 then moves on 14, to be taken by the black, who is afterwards retaken by the other king. If the black king move on 38, 27, or 16, the white king 25 is brought upon the square 43. The black must take, placing himself upon 49. The white king 28 then places himself on 44, to be taken by the black king, who is immediately taken.

XVI. White, 7, 35, 37, kings.

Black, 43, a king.

The white king 37 is moved on the square 48, and the black is lost wherever he goes. If the black king goes to the end of the line 49 to 16, (the white king is to be left on the square 7 to be taken) the white king 48 is moved on any square in the line 48 to 26, or on the square 30. And when the black king shall have taken the white king 7, the before-mentioned white king is given to be taken by the black king, who is immediately retaken by the remaining white king. Or, if the black king should not go to the end of the line 49 to 16, then the white king 48 must be placed on 43, to be taken by the black. Afterwards the white king 7 is placed on the square 16, by which means the black is shut up, or cannot move without being taken.

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XVII. White 20, 24, 35, kings.

Black, 15, a man—46, a king.

In this situation the white win, in consequence of the black having neglected to sacrifice the black man. The black is to play, and cannot play any where without losing. If the black king move upon the square 5, the white king 20 is moved on square 14. The black must take two and be retaken. Or, if the black king move on any of the other squares in the line, the white king 24 moves on the square 30. The black then takes, and the white king takes the black man and his king. It is therefore to be observed, that when you are left with a king and a man against three kings, it is best to sacrifice the man as soon as you have the opportunity, the keeping of him being frequently the occasion of your losing a game (as in the above instance) which otherwise could only be a drawn game.

In the two following situations of a single king, against a king and three men, the game becomes a drawn game:

XVIII. White, a king in the centre diagonal line 5 to 46.

Black, 36, 31, 26, men—and a king any where.

In consequence of the white king having the command of the centre diagonal line, it is not possible for the black men to move on to king; and in their present situation, it is also impossible for them to make any stroke. This is, in consequence, decidedly a drawn game.

XIX. White, a king on the diagonal line 6 to 50.

Black, 16, 21, 26, men—a king any where except on the above line.

Here the black go to king on the line 1, 2, 3, 4, 5.

This is a drawn game, for the same reason, provided the white king be conveyed on the squares 50 and 6, when the black king goes on the squares 45 and 1.

Situations for compelling a single king to quit the centre diagonal line, in order to the opening of a passage to king for your men:

XX. White, 20, 24, 35, men—a king on 15 or 6.

XXI. 20, 24, 35, men—a king on 45.

XXII. 15, 24, 35, men—a king on 25.

XXIII. 15, 20, 24, 35, men.

And other similar situations, in consequence of which the black king must immediately quit the centre diagonal line, or be taken.

Four kings against one king must win; and the game is won immediately, if they be placed as follows:

XXIV. White, 36, 37, 46, 47, kings.

Black, a king any where.

The black king cannot escape. If he be placed on 26, then move the white king 36 on the square 31. The black must remove, and the white give two for one. If he be placed on 4 or 15, then move the white king 37 on 10, to be taken, and then place a white king opposite, either on 4 or 15, as the case may require.

Four kings against two kings must be a drawn game, unless placed in such a situation as the following:

XXV. White 3, 4, 6, 47, kings.

Black, 5, 36, kings.

The white king 3 is moved on square 17, and

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the black lose. If the black king 5 move on square 46, then the white king is moved on 41.

The black king takes two kings and is retaken by the white king 6, who then is to place himself on 22, thereby obliging the other black king to take and be retaken. Or, if the black king 6 moves on any other square than 46, or the other king move, the loss is still more obvious.

Five kings occupying or having the command of the centre diagonal line, immediately prevail against two kings, who cannot escape in any situation:

XXVI. White, 27, 36, 38, 46, 47, kings.

Black, 1, 50, kings.

The white king 46 is moved either on 28 or 23; whereby the black has two to take; and the white king by whom he is retaken, places himself so as to force the other black king to take two more, and then be retaken.

Situation in which five kings readily win the game, against two kings who occupy the centre diagonal line:

XXVII. White, 3, 4, 34, 36, 45, kings.

Black, 5, 46, kings.

The black to play.

1st. If the black king 46 plays on square 37, 32, or 28, the white king 4 moves on 14. The black king then takes the two white kings, and is, as well as the other black king, retaken by the white king 45.

2d. Or, if the black king 46 be played on 19, the white king moves on 14, and is taken by the black, who is retaken by the white king 4. The black must then move on square 14, 19, 28, 32, 37, 41, or 46. On whichever he moves, the white king 36 is carried on the square 22, 13, or 9; compelling the black to quit the centre line. The player of the white may then, if necessary, gain possession of the squares 36, 37, 46, and 47, as is pointed out in situation No. 24, to take the remaining black king.

3d. Or, if the black king 5 be moved on 19, the stroke of two for two is visible.

4th. Or, if the black king 5 be moved on 28 or 32, the white king 36 goes on 41, and is taken by the black king 46. The white king 4 is then placed on 10 and taken. The white king 3 is then moved on 14, and the black take two, and are immediately after both retaken.

5th. Or, if the black king 5 be moved on 37, then the white king 4 is moved on 31, and taken by the black. The white king 36 is then placed on 41, and the black king 46 takes two, is retaken by the white king 45, who in doing so is placed on 12, to be taken by the other black king, who is again retaken by the white king 3.

Some very curious strokes, denominated, in the French Treatise, chap. viii. Coup de Repos, Lunettes, &c.

The Coup de Repos consists in this: whilst one player has several successive times to take, the other, in the intervals, moves unmolested his man into a situation to be immediately after ready to act against the enemy. This stroke occurs in the four following instances.

I. White, 23, 29, 30, 31, 34, 35, 36, 48.

Black, 5, 7, 8, 9, 10, 12, 13, 18, 22, 25, 26.

White.
From 30 to 24
48 — 42
23 — 19
29 — 23
35 — 4
4 — 15

Black.
From 26 to 37
37 — 48
48 — 30
18 — 20
13 — 24
The rest is obvious.

II. White, 26, 27, 33, 36, 37, 38, 39, 42, 43, 46, 47, 49.

Black, 2, 4, 6, 7, 8, 9, 16, 17, 18, 19, 23, 30.

White.	Black.
From 27 to 21	From 16 to 27
36 — 31	27 — 36
37 — 31	36 — 27
33 — 28	23 — 32
39 — 34	30 — 37
47 — 41	32 — 43
41 — 1	43 — 48
46 — 41	48 — 25
49 — 43	25 — 48
41 — 37	48 — 31
26 — 37	Lost.

III. White, 15, 21, 31, 32, 34, 35, 37, 42, 43, 45.

Black, 7, 12, 13, 14, 17, 19, 23, 25, 26, 44.

White.	Black.
From 43 to 39	From 44 to 33
32 — 28	23 — 41
15 — 10	26 — 48
10 — 4	48 — 30
4 — 3	17 — 26
35 — 13	12 — 17
3 — 21	26 — 17
13 — 8	17 — 22
8 — 2	7 — 12
2 — 11	22 — 27
11 — 28	The rest is seen.

IV. White, 6, a king—26, 30, 33, 34, 39, 43, 48, men.

Black, 3, 4, 5, 9, 10, 15, 17, 19, 20, 22, 25, 32, 37, men.

White.	Black.
From 48 to 42	From 3 to 48
34 — 28	22 — 44
6 — 41	48 — 39
34 — 43	25 — 34
41 — 50	Lost, if the white play correctly.

Examples of men placed in exposed situations, for the purpose of enticing the adversary to attack them; in consequence of which, similar strokes to the two undermentioned frequently occur.

I. White, 26, 27, 29, 30, 33, 34, 35, 38, 40, 42, 45.

Black, 7, 8, 12, 13, 14, 15, 18, 19, 20, 22, 23, 25.

The capture of the white man behind whom the black man 22 is placed need not be lost to the white, inasmuch as he might exchange one for one. But he, perceiving the error of the black, plays as follows:

White.	Black.
From 26 to 21	From 22 to 31
21 — 17	12 — 21
33 — 28	23 — 43
42 — 38	43 — 32
29 — 24	20 — 29
34 — 3	25 — 34
3 — 43	Lost.

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II. White, 25, 27, 28, 32, 35, 36, 37, 38, 42, 43, 45, 48, 50.

Black, 6, 7, 8, 9, 10, 12, 13, 15, 16, 18, 19, 21, 23, 26, 29.

Here the white gives two for two, whereby a man remains exposed, behind which the black immediately places a man, anxious to secure him, but this proves a sad delusion.

White.	Black.
From 27 to 22	From 18 to 27
37 — 31	26 — 37
42 — 22	12 — 18
35 — 30	18 — 27
28 — 22	27 — 18
32 — 28	23 — 32
38 — 27	21 — 32
30 — 24	29 — 20
25 — 5	Lost.

Two examples on lunettes, or two or more pieces, between which there is an empty square, and behind there are other empty squares in the line they are placed on.

III. White, 28, 34, 37, 39, 40, 48.

Black, 12, 13, 14, 16, 24, 25, 27.

Here the black plays, and goes incautiously into the lunette; the white then plays from 34, to 30. The black is compelled to take four with his man 24, who then rests on 22, when the white retakes five with the man 37, and the white afterwards gets to king without any difficulty.

IV. White, 24, 25, 30, 33, 36, 43, 48, 50.

Black, 7, 13, 14, 17, 19, 26, 29, 37.

White.	Black.
From 48 to 42	From 37 to 28
24 — 2	Lose.

The following situations afford strokes for capturing one or more kings, who are apparently not in danger.

I. White, 27, 28, 29, 33, 35, 36, 37, 39, 46, 48, 49, men.

Black, 2, a king—3, 8, 12, 15, 16, 18, 19, 25, 26, men.

White.	Black.
From 37 to 31	From 26 to 37
46 — 41	37 — 46
39 — 34	46 — 23
27 — 22	18 — 27
29 — 7	2 — 30
35 — 2	Must lose.

II. White, 30, 31, 32, 34, 35, 36, 43, 45, 48, 49, men.

Black, 11, a king—I, 4, 5, 6, 8, 10, 15, 20, men.

White.	Black.
From 49 to 44	From 11 to 50
43 — 39	50 — 26
48 — 42	26 — 48
30 — 25	48 — 30
25 — 14	10 — 19
35 — 2	Have lost.

III. White, 28, 29, 32, 33, 37, 43, men.

Black, 9, 10, 46, kings—30, a man.

White.	Black.
From 29 to 24	From 30 to 19
28 — 22	Takes 9 — 28

Where he must remain, being stopped by the white 32, over whom he cannot again pass. (See rules 6 and 7).

32 — 5
Shut up.

IV. White, 19, 25, 26, 35, 36, 39, 42, 44, 45, 47, 50, men.

Black, 3, 12, 22, 27, kings—4, 5, 10, 15, men.

This situation and subsequent stroke, M. Mounoury does not vouch for as having actually occurred at play; he candidly supposes the same to have been composed: but it evidently must have been done by a good player, and shews that this game is susceptible of great ingenuity.

White.	Black.
From 19 to 13	From 22 to 9
39 — 34	12 — 49
36 — 31	27 — 36
26 — 21	3 — 48
47 — 41	36 — 47
50 — 44	49 — 40
45 — 34	48 — 30
35 — 24	47 — 20
25 — 3	Can no longer play.

Different situations in which brilliant and well-calculated strokes have occurred.

I. White, 17, 22, 23, 27, 31, 33, 36, 37, 38, 40, 44, 50.

Black, 1, 5, 6, 7, 8, 9, 10, 13, 20, 25, 26, 30

This situation occurred at a game played with the celebrated player, Marchand, who had the white men, and played as follows:

White.	Black.
From 23 to 19	From 13 to 24
33 — 29	24 — 42
37 — 48	26 — 37
17 — 11	6 — 28
36 — 31	37 — 26
27 — 21	26 — 17
40 — 34	30 — 39
44 — 24	Lost.

II. White, 26, 27, 28, 29, 31, 32, 33, 35, 36, 37, 38, 39, 40, 42, 43, 45, 49.

Black, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 22.

White.	Black.
From 29 to 23	From 18 to 29
33 — 24	22 — 44
35 — 30	44 — 35
27 — 22	17 — 28
32 — 5	Lose.

III. White, 25, 26, 27, 28, 30, 31, 32, 33, 35, 36, 37, 40, 41, 45, 48.

Black, 6, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24.

This is a very fine, and well-calculated stroke.

White.	Black.
From 23 to 20	From 14 to 34
40 — 20	15 — 24
35 — 30	24 — 35
45 — 40	35 — 44
33 — 29	23 — 34
28 — 22	17 — 28
32 — 1	21 — 32
1 — 27	Lost.

IV. White, 27, 28, 32, 33, 35, 36, 38, 39, 40, 42, 43, 44, 45, 48.

Black, 3, 6, 7, 8, 9, 12, 13, 14, 16, 17, 18, 19, 23, 24, 26.

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White.	Black.
From 35 to 30	From 24 to 35
33 — 29	23 — 34
39 — 30	35 — 24
27 — 22	18 — 27
32 — 21	16 — 27
28 — 23	19 — 28
37 — 32	28 — 37
42 — 2	Must lose.

V. White, 22, 25, 27, 28, 30, 32, 33, 34, 35, 37,
38, 39, 40, 43, 45, 47.
Black, 2, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18,
19, 21, 24, 26.

White.	Black.
From 25 to 20	From 14 to 25
28 — 23	19 — 17
30 — 19	13 — 24
34 — 30	25 — 34
40 — 20	15 — 24
37 — 31	26 — 28
33 — 15	21 — 32
38 — 27	Lost.—The black have 8 men remaining against 7 white; but observe, there is no- thing to prevent the white going to king.

I. White, 24, 26, kings—42, 45, 50, men.
Black, 34, 41, men—46, a king.

White.	Black.
From 45 to 40	From 34 to 45
42 — 37	41 — 32
26 — 37	32 — 41
24 — 47	Shut up.

II. White, 14, 15, 25, 46, men—40, a king.

Black, 3, 4, 5, 37, 38, men—13, a king.

White.	Black.
From 15 to 10	From 4 to 15
25 — 20	15 — 24
46 — 41	37 — 46
40 — 49	46 — 10
49 — 29	Lost.

III. White, 19, 23, 25, 28, kings.

Black, 26, 48, kings.

Here is one of the situations in which the gain of the game depends on well playing at the spur of the moment, otherwise the black succeed in drawing the game. Several good players, before whom this situation was laid, tried ineffectually to discover the stroke for winning; which is as follows:

White.	Black.
From 19 to 30	From 48 to 42
28 — 37	42 — 31
30 — 8	26 — 3
23 — 14	3 — 20
25 — 36	Lost.

Another way.

White.	Black.
From 19 to 30	From 48 to 31
30 — 34	26 — 3
The rest as before.	Lost.

Another way.

White.	Black.
From 19 to 30	From 26 to 21
30 — 34	48 — 30
25 — 16	Lost.

Another way.

White.	Black.
From 19 to 30	From 26 to 3
23 — 14	3 — 20
25 — 8	48 — 25
28 — 14	25 — 9
3 — 14	Lost.

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IV. White, 20, a king—29, 36, 43, men.

Black, 19, a king.

Here the black king goes into the lunette.

White.	Black.
From 43 to 38	From 24 to 47
20 — 15	Shut up.

V. White, 9, 22, 27, 32, 35, 38.

Black, 12, 15, 26, men—50, a king.

White.	Black.
From 9 to 4	From 50 to 6
38 — 33	6 — 50
27 — 21	26 — 17
32 — 28	50 — 22
4 — 36	Lost.

VI. White, 27, 28, 33, 37, 38, 39.

Black, 1, 2, 8, 16, 19, 20, 26.

White.	Black.
From 37 to 31	From 26 to 37
27 — 21	16 — 27
28 — 22	27 — 18
38 — 32	37 — 28
33 — 15	Lost.

VII. White, 1, 9, 34, kings—40, a man.

Black, 16, a man—45, 49, kings.

White.	Black.
From 9 to 27	From 49 to 35
27 — 49	45 — 23
1 — 40	35 — 44
49 — 40	Lost.

Another way.

White.	Black.
From 9 to 27	From 49 to 21
34 — 12	45 — 7
1 — 26	Lost.

VIII. White, 11, 43, men—17, 39, kings.

Black, 6, a man—32, a king.

White.	Black.
From 39 to 30	From 32 to 49
30 — 35	Lost every where.

Our limits will not allow us to select a greater number of curious situations. Those who are desirous of pursuing them farther must consult Mr. Polhman's work, which extends them to upwards of a hundred.

POLISHABLE. *a.* (from *polish*.) Capable of being polished.

POLISHER, or BURNISHER, among mechanics, an instrument for polishing and burnishing things proper to take a polish. The gilders use an iron-polisher to prepare their metals before gilding, and the blood-stone to give them the bright polish after gilding. The polishers, among cutlers, are a kind of wooden wheels made of walnut-tree, about an inch thick, and of a diameter at pleasure, which are turned round by a great wheel; upon these they smooth and polish their work with emery and putty. The polishers for glass consist of two pieces of wood; the one flat, covered with old hat: the other long and half-round, fastened on the former, whose edge it exceeds on both sides by some inches, which serves the workmen to take hold of, and to work backwards and forwards by. The polishers used by spectacle-makers are pieces of wood a foot long, seven or eight inches broad, and an inch and a half thick; covered with old beaver hat, whereon they polish the shell and horn frames their spectacle-glasses are to be set in.

POLISHING, in general, the operation of

giving a gloss or lustre to certain substances, as metals, glass, marble, &c.

The operation of polishing optic-glasses, after being perfectly ground, is one of the most difficult points of the whole process. Before the polishing is begun, it is proper to stretch an even well-wrought piece of linen over the tool, dusting upon it some very fine tripoli. Then taking the glass in your hand, run it round forty or fifty times upon the tool, to take off the roughness of the glass about the border of it. This cloth is then to be removed, and the glass to be polished upon the naked tool, with a compound powder made of four parts tripoli mixed with one of fine blue vitriol; six or eight grains of which mixture are sufficient for a glass five inches broad. This powder must be wetted with eight or ten drops of clear vinegar, in the middle of the tool; being first mixed and softened thoroughly with a very fine small mullet. Then with a nice brush, having spread this mixture thinly and equably upon the tool, take some very fine tripoli, and strew it thinly and equably upon the tool so prepared, after which, take the glass to be polished, wiped very clean, and apply it on the tool, and move it gently twice or thrice in a straight line backwards and forwards; then take it off, and observe whether the marks of the tripoli, sticking to the glass, are equably spread over the whole surface; if not, it is a sign that either the tool or glass is too warm, in which case you must wait awhile and try again, till you find the glass takes the tripoli every where alike. Then you may begin to polish boldly, there being no danger of spoiling the figure of the glass, which in the other case would infallibly happen. This is Mr. Huygens's method; but it ought to be observed, that almost every operator has a peculiar one of his own, and of which some of them make a mighty secret.

Sir Isaac Newton nowhere expressly describes his method of polishing optical glasses; but his method of polishing reflecting metals he thus describes in his Optics. He had two round copper plates, each six inches in diameter, the one convex, the other concave, ground very true to one another. On the convex one he ground the object-metal; or concave which was to be polished, till it had taken the figure of the convex, and was ready for a polish. He then pitched over the convex very thinly, by dropping melted pitch upon it, and warming it to keep the pitch soft, whilst he ground it with the concave copper wetted, to make it spread evenly all over the convex, till it was no thicker than a groat-piece; and after the convex was cold he ground it again, to give it as true a figure as possible. He then ground it with very fine putty, till it made no noise; and then upon the pitch he ground the object-metal with a brisk motion for two or three minutes; when laying fresh putty upon the pitch, he ground it again till it had done making a noise, and afterwards ground the object-metal upon the pitch as before; and this operation he repeated till the metal was perfectly polished.

For other ingenious methods of grinding and polishing lenses and specula, see Brewster's edition of Ferguson's Lectures, vol. ii. p. 452—461.

POLITE. *a.* (*politus*, Latin.) 1. Glossy; smooth (*Newton*). 2. Elegant of manners (*Pope*).

POLITELY. *ad.* (from *polite*.) With elegance of manners; genteelly.

POLITENESS. *s.* (*politesse*, Fr.) Elegance of manners; gentility; good breeding (*Swift*).

POLITIANO (Angelo), an ingenious Italian, born 1454, at Monte Pulciano, in Tuscany. He learnt Greek under Andronicus of Thessalonica, and studied philosophy under Ficinus and Argyropylus. He was noticed by the Medicean family, and was for some time preceptor to Lorenzo's children, and afterwards professor of Greek and Latin at Florence. He was the intimate friend of the learned men of the times, and died 1494, as some say, from great grief for the misfortunes of the Medicean family, who had been expelled from their country. As a poet his lines on the tournament of Julian de Medicis are much admired. He wrote besides the history of the Pazzi conspiracy—miscellanea—some other poems, and a Latin translation of Herodian, so elegant and so spirited, that it is doubted which is the more valuable, the original or the version—a treatise on anger, &c. His works altogether were printed in 1550, 3 vols. 8vo. and 1553, folio.

POLITICAL. *a.* (*πολιτικός*.) 1. Relating to politics; relating to the administration of public affairs; civil (*Rogers*). 2. Cunning; skilful: usually in this latter sense, written *politic*.

POLITICAL ARITHMETIC, is the art of reasoning by figures upon matters relating to government, such as the revenues, number of people, extent and value of land, taxes, trade, &c. in any nation. These calculations are generally made with a view to ascertain the comparative strength, prosperity, &c. of any two or more nations.

POLITICAL ECONOMY, is the science in which the wealth of nations is considered. Its object is to ascertain, in the first place, wherein wealth consists, and then to explain the causes of its production, and the principles on which it is distributed through the different orders of society. It likewise endeavours to point out the tendency which any political regulations may have to favour or to injure the productions or most advantageous distribution of wealth. Such is its peculiar object, and consequently though writers on political economy may frequently treat on the more important topics of national security, freedom and happiness, these are then passing the strict limits of their science.

Political economy, in some of its branches, has engaged the attention of speculative men in all ages; but it is only in very recent times that the truths it exhibits have been collected, arranged, and demonstrated with such precision, as to entitle it to the name and dignity of a science.

The writers on political economy may be arranged in two great classes; the former composed of those who regard commerce, and the latter of those who regard agriculture as the principal source of national wealth. Almost all the older writers belong to the former class. The most considerable English writers of this class are Dr. d'Avenant and sir John Stewart, and their principles are interwoven in the elaborate History of Commerce, by Anderson. The decisions of the English legislature have usually been guided by the principles of these writers.

The commercial system of political economy is very perspicuously explained, and very ably examined in the fourth book of Smith on the Wealth of Nations.

The agricultural system is of comparatively recent origin. It was first brought into vogue by Mons. Quesnai, a celebrated French physician. His ideas were adopted and diffused by several very able writers, and are thought to be most clearly explained in L'Ordre Naturel de Sociétés Politiques, by Mercier de la Rivière. The writings of Quesnai have been published, with remarks and illustrations in a work entitled Physiocratie, by Dupont de Nemours. The followers of Quesnai are styled the economists. There is no English writer of celebrity by whom these principles have been adopted in their whole extent; but they are stated, and in some degree controverted, in the last chapter of the fourth book of Smith.

By far the greatest work on political economy is the treatise on the Wealth of Nations, by Adam Smith. The acuteness of later writers may have discovered some inconsiderable errors in the reasonings; may have shewn that some portions of it are not so completely finished as the rest, and that some well grounded objections may be urged against parts of its arrangement; but the most able judges unanimously regard it as a work at once original, accurate, and profound; as just in its principles, and perspicuous in its illustrations.

A striking and very important difference between the old and new systems of political economy consists in the former calling upon all occasions for the regulation and controul of laws, and regarding the legislature as best qualified to estimate the value of any particular branches of trade, or modes of conducting business; while by the latter the merchant is supposed to be the best judge of the most eligible method of conducting his own affairs. The former is a system of restrictions and encouragements in which little is left to the choice and sagacity of individuals; in the latter it is supposed that national wealth, which is the aggregate of individual wealth, will increase most rapidly, where, while private property is rendered sacred by the laws, talent and enterprise are under the least possible restraint.

POLITICALLY. *ad.* 1. With relation to public administration. 2. Artfully; politically.

POLITICASTER. *s.* A petty ignorant pretender to politics (*L'Estrange*).

POLITICIAN. *s.* (*politicien*, French.) 1. One versed in the arts of government; one skilled in politics (*Dryden*). 2. A man of artifice; one of deep contrivance (*Milton*).

POLITIC. *a.* (*πολιτικός*.) 1. Political; civil (*Temple*). 2. Prudent; versed in affairs (*Shakspeare*). 3. Artful; cunning (*Bacon*).

POLITICLY. *ad.* Artfully; cunningly (*Shakspeare*).

POLITICS. *s.* (*politique*, Fr. *πολιτική*.) The science of government; the art or practice of administering public affairs (*Addison*).

POLITURE. *s.* (*politure*, Fr.) The gloss given by the act of polishing.

POLITY. *s.* (*πολιτεία*.) A form of government; civil constitution (*Hooker*).

POLIUM. (*πολιον*, from *πολιος*, white; so called from its white capillaments.) Poley.

POLITO, or **POLIZZI**, a town of Sicily, in Val di Demona, at the foot of the mountain Madonia, 30 miles S.E. of Palermo. Lon. 13. 53 E. Lat. 38. 4 N.

POLITZ, a town of Upper Saxony, in Anterior Pomerania, near the Frisch Haff, celebrated for its hops. It is eight miles N. of Stetin.

POLL. *s.* (*polle*, *pol*, Dutch, the top.) 1. The head (*Shakspeare*). 2. A catalogue or list of persons; a register of heads or persons (*Shakspeare*). 3. A fish called generally a chub, or chevin.

To POLL. *v. n.* (from the noun.) 1. To lop the tops of trees (*Bacon*). 2. In this sense is used *polled* sheep (*Mortimer*). 3. To pull off hair from the head; to clip short; to shear (*Ezekiel*). 4. To mow; to crop (*Shakspeare*). 5. To plunder; to strip; to pill (*Bacon*). 6. To take a list or register of persons. 7. To enter one's name in a list or register (*Dryden*). 8. To insert into a number as a voter (*Tickel*).

POLL-EVIL, in farriery, a name given to an abscess formed near to the head of a horse, about the junction of the first vertebra of the neck. It commonly proceeds either from a blow or hurt received on the head, as by his accidentally striking it against the ceiling of a low stable. Mr. Denny advises, that whenever this is perceived, by a tumour forming about this part, the earliest and most active means should be employed to disperse it.

The most effectual remedy, he says, is that of anointing the inflamed parts with blistering liniment; for, by this simple treatment alone, an abscess may generally be prevented. Whenever the inflammation, however, has proceeded to suppuration, as soon as the matter can be distinctly felt, an opening must be made as near as possible to the inferior part of the abscess, to allow of a free discharge of its contents, and a seton be introduced through the whole extent of the cavity, which should be frequently moved, and washed with spirits of turpentine. The healing process may be assisted by daily injecting into the cavity of the abscess a lotion of muriated mercury with tincture of myrrh.

POLLACK, in ichthyology. See **GADUS**.
POLLARD. *s.* (from *poll*.) 1. A tree lop-

ged (*Bacon*). 2. A clipped coin (*Camden*).

3. The chub fish (*Ainsworth*).

POLLEN, in botany, farina, or prolific powder, like fine meal or flower, contained in the anther of flowers; and which, according to Linnæus, being moistened with a liquor peculiar to it, and lodged upon the stigma, bursts like a bladder, and explodes elastically a substance imperceptible to the naked eye; which he calls *fovilla*. Pollen, when exposed to the microscope, is found to put on a great variety of forms in the flowers of different plants. Thus in *helianthus* it is a prickly ball, like a burr. In *geranium* it is perforated. In *symplythum* it is twin or double. In *malva* it is a toothed wheel. In *viola* it is angular. In *narcissus* it is kidney-shaped. In *borage* it is like a roll of parchment.

POLLENGER. *s.* Brushwood.

POLLER. *s.* (from *poll.*) 1. Robber; pil-lager; plunderer (*Bacon*). 2. He who votes or polls.

POLLEX. The thumb, or great toe.

POLLIA, in botany, a genus of the class hexandria, order monogynia. Corol six-petalled, inferior, the three outer petals larger, three inner reflected; berry many-seeded. One species; an herbaceous plant of Java and Japan, with white flowers in a whorled corymb.

POLLICHIA, in botany, a genus of the class monandria, order monogynia. Calyx one-leaved, five-toothed; corol five-petalled; seed one; receptacle producing succulent scales sustaining the fruit. One species; a Cape plant with green flowers in sessile, opposite axillary clusters.

POLLIO. The most celebrated of this name is C. Asinius, a Roman consul, in the reign of Augustus, distinguished as much by his eloquence as by his military exploits. He defeated the Dalmatians, and favoured the cause of Antony against Augustus. He patronized with great liberality the poets Virgil and Horace, and was the first who raised a public library at Rome. He was with Julius Cæsar when he crossed the Rubicon, and was greatly esteemed by Augustus after the ruin of Antony. Pollio wrote some tragedies, orations, and an history, in 17 books, which are all lost, and nothing remains of his writings except a few letters to Cicero. He died in the 80th year of his age, A. D. 4. It is to him Virgil has inscribed his fourth eclogue.

To **POLLUTE**. *v. a.* (*polluo*, Lat.) 1. To make unclean, in a religious sense; to defile (*Shakspeare*). 2. To taint with guilt (*Milton*). 3. To corrupt by mixtures of ill (*Dryden*).

POLLUTEDNESS. *s.* (from *pollute*.) Defilement; the state of being polluted.

POLLUTER. *s.* (from *pollute*.) Defiler; corrupter (*Dryden*).

POLLUTION. *s.* (*pollutio*, Lat.) 1. The act of defiling (*Ayliffe*). 2. The state of being defiled; defilement.

POLLUX. See **CASTOR**.

POLLUX (Julius), a Greek writer, who flourished A. D. 186, in the reign of Commodus,

and died in the 58th year of his age. He taught rhetoric at Athens, and wrote an useful work called *Onomasticon*.

POLLUX, in astronomy, a fixed star of the second magnitude, in the constellation Gemini, or the twins. See **CASTOR** and **GEMINI**.

POLOTSK, a government of the Russian empire, formed of part of a palatinate of Lithuania, dismembered from Poland by the treaty of partition in 1772. Its products are chiefly grain, hemp, flax, and pasture; and the forests furnish great abundance of masts, planks, oak for ship-building, pitch, tar, &c. which are chiefly sent down the Dwina to Riga.

POLOTSK, a strong town of Russia, capital of a government of the same name, seated on the Dwina, at the mouth of the small river Polota, 50 miles S.W. of Vitepsk. Lon. 27. 50. E. Lat. 55. 43 N.

POLTEN (St.), a town of Lower Austria, seated on the Drasam, which falls into the Danube, near Holmburgh, eight miles from Vienne.

POLTROON, or **POLTRON**, a coward or dastard, wanting courage to perform any thing great or noble. The word is borrowed from the French, who, according to Salmasius, derive it a *pollice truncato*; because anciently those who would avoid going to the wars cut off their thumb. But Menage, with more probability, derives it from the Italian *paltron*, and that from *paltro*, a bed; because timorous, pusillanimous people take pleasure in lying a-bed. Others choose to derive the word from the Italian *paltro*, a colt; because of that creature's readiness to run away.

POLVERINE, the calcined ashes of a plant; of a similar nature with our pot-ashes or pearl-ashes. It is brought from the Levant and Syria; and in the glass-trade it is always to be preferred to any other ashes. The *barilla*, or pot-ashes of Spain, yield more pure salt than the pulverine of the Levant, but the glass made with it has always some blue tinge; that made with the pulverine is perfectly white, which ought always to be used for the finest crystal.

PO'LY. (*πολυς*.) A prefix often found in the composition of words derived from the Greek, and intimating multitude: as, *polygon*, a figure of many angles.

POLYACOUSTIC. *a.* (*πολυς* and *ακουω*.) That multiplies or magnifies sounds.

POLYADELPHIA. (*πολυς*, many, and *αδελφος*, a brother; several brotherhoods.) In botany, the name of the eighteenth class in the Linnæan system; comprehending those plants which bear herinaphrodite flowers, with three or more sets of united stamens.

POLYÆNUS, the name of many famous men recorded in ancient writers. Among them was Julius Polyænus, of whom we have some Greek epigrams extant in the first book of the *Anthologia*. The Polyænus whom it most concerns us to know about, is the author of the eight books of the *Stratagems of illustrious Commanders in War*. He was probably a Macedonian, and perhaps a soldier in the

early part of his life; but of this there is no certainty. He was undoubtedly a rhetorician and a pleader of causes; and appears, from the dedication of his work to the emperors Antoninus and Verus, to have lived towards the latter part of the second century. The *Stratagemata* were published in Greek by Isaac Casaubon, with notes, in 1589, 12mo; but no good edition of them appeared till that of Leyden, 1690, in 8vo. The title-page runs thus: Polyæni Stratagematum libri octo, Justo Vulteo interprete, Pancratius Maasvicius recensuit, Isaaci Casauboni nec non suas notas adiecit. This is indeed a very elegant edition, in which the notes of Casaubon and Maasvicius accompany each page.

POLYÆMIA. (from πολυς, much, and αἷμα, blood.) Plethora. Redundancy of blood.

POLYANDRIA. (πολυς and ἀνὴρ, a husband.) In botany, the name of the thirteenth class in the Linnæan system, comprehending those plants which bear hermaphrodite flowers with many stamens (from twenty to a thousand) growing single on the receptacle. The number of the stamens distinguishes this from the first eleven classes; their situation (on the receptacle) separates it from the twelfth class, icosandria: and their simplicity avoids all confusion with the sixteenth and eighteenth classes, monodelphia and polyadelphia.

POLYANTHEA, a collection of common-places in alphabetical order, for the use of orators, preachers, &c. The word is formed from the Greek πολυς, much, and ἄνθος, flower; and has much the same meaning with anthology or florilege. The first author of the polyanthea was Dominic Nanni de Mirabellio, whose labour has been improved on by Barth. Amantius, and Franc. Torsius; and since these, by Jos. Langius, under the title of *Polyanthea nova*, 1613.

POLYANTHES, in botany, a genus of the class hexandria, order monogynia. Corol funnel-form, incurvated, equal; filaments inserted in the throat of the corol; germ seated in the bottom of the corol. One species only, *P. tuberosa*, an herbaceous flowering perennial of Java and Ceylon.

There are varieties with a double flower; with striped leaves; and with a smaller flower. The last is frequent in the south of France, whence the roots have been often brought here early in the spring, before the market is supplied with the same sort from Italy.

This plant, however, is chiefly cultivated by the Genoese, from whom most other countries are supplied when the roots cannot be propagated without great trouble and labour. For about Genoa, in Sicily and Spain, the roots will multiply, when once planted, with little or no attention.

In cultivating this plant it should be observed that the blowing roots, imported for sale, are mostly furnished with offsets, which should be separated previously to planting. They should be preserved in dry sand and in a dry sheltered place during winter; and in the beginning of spring, as the month of March, may be planted

out either in a bed of light dry earth in the full ground, or, if wanted in a forward state, in a moderate hot-bed; care being taken to shelter them in cold-weather, either by a frame and lights, or mats on arched hoops; the air being freely enjoyed by them in mild weather, and giving them plenty of water in dry seasons, and through the whole period of flowering.

These plants are all highly ornamental, but especially the single and double sorts, among other tender potted plants. The dwarf and variegated sorts afford also a fine and agreeable intermixture.

POLYANTHUS, in botany. See **PRIMULA**.

POLYANTHUS NARCISSUS, in botany. See **NARCISSUS**.

POLYBIUS, a famous Greek historian, was born at Megalopolis, a city of Arcadia, 205 years before Christ; and was the son of Lycortas, chief of the republic of the Achæans. He was trained to arms under the celebrated Philopœmen, and is described by Plutarch as carrying the urn of that great but unfortunate general in his funeral procession. He rose to considerable honours in his own country, but was compelled to visit Rome with other principal Achæans, who were detained there as pledges for the submission of their state. From hence he became intimate with the second Scipio Africanus, and was present with him at the demolition of Carthage. He saw Corinth also plundered by Mummius, and thence passing through the cities of Achaia, reconciled them to Rome. He extended his travels into Egypt, France, and Spain, that he might avoid such geographical errors as he has censured in others.

It was in Rome that he composed his excellent history, for the sake of which his travels were undertaken. The history was divided into 40 books; but there only remain the five first with extracts of some parts of the others. It has had several editions in Greek and Latin; and there is an English translation by Mr. Hampton. He died at the age of 82.

POLYCARDIA, in botany, a genus of the class pentandria, order monogynia. Petals five, rounded; stigma lobed; capsule five-celled, five-valved; seeds arillate. One species only; a Madagascar shrub with alternate leaves; barren ones lanceolate, fertile ones inversely heart-shaped, wedge-shaped at the base; flowers three or four at the tip of the fertile leaves.

POLYCARP, one of the most ancient fathers of the Christian church, was born towards the end of the reign of Nero, probably at Smyrna; where he was educated at the expense of Calista, a noble matron distinguished by her piety and charity. He was unquestionably a disciple of St. John the Evangelist, and conversed familiarly with others of the apostles. When of a proper age, Bucolus ordained him a deacon and catechist of his church; and upon his death he succeeded him in the bishopric, to which he is said to have been consecrated by St. John, who also directed his Apocalypse, among others, to him; under the title of the

Angel of the Church of Smyrna. At length the controversy about the observation of Easter beginning to grow high between the eastern and western churches, he went to Rome to discourse with those who were of the opposite party. The see was then possessed by Anicetus, with whom he had many conferences, that were carried on in the most peaceable and amicable manner; and though neither of them could bring the other to embrace his opinion, they both retained their own sentiments without violating that charity which is the great law of their religion.

Whilst at Rome he particularly opposed the heresies of Marcion and Valentinus. His conduct on this occasion is related by Irenæus; who informs us, that when Polycarp passed Marcion in the street without speaking, Marcion said, "Polycarp, own us!" to which he replied with indignation, "I own thee to be the first born of Satan." Irenæus adds, that when any heretical doctrines were spoken in his presence, he would stop his ears and say, "Good God! to what times hast thou reserved me, that I should hear such things!" and immediately left the place. He was wont to tell, that St. John, going into a bath at Ephesus, and finding Cerinthus the heretic in it, immediately started back without bathing, crying out, "Let us run away, lest the bath should fall upon us while Cerinthus the enemy of truth is in it." Polycarp governed the church of Smyrna with apostolic purity, till he suffered martyrdom in the 7th year of Marcus Aurelius; the 7th of the kalends of May, A. C. 167. The amphitheatre on which he suffered was mostly remaining not many years ago; and his tomb, which is in a little chapel in the side of a mountain, on the south-east of this city, was solemnly visited by the Greeks on his festival day; and for the maintenance and repairing of it, travellers were wont to throw a few aspers into an earthen pot that stands there for the purpose. He wrote some homilies and epistles, which are now lost, except that to the Philippians, which is a truly pious and Christian piece, containing short and useful precepts and rules of life, which St. Jerome informs us was even in his time read in the public assemblies of the Asiatic churches. It is singularly useful in proving the authenticity of the books of the New Testament; for he has several passages and expressions from Matthew, Luke, the Acts, St. Paul's Epistles to the Philippians, Ephesians, Galatians, Corinthians, Romans, Thessalonians, Colossians, 1st Timothy, 1st Epistle of St. John, and 1st of Peter; and makes particular mention of St. Paul's Epistle to the Ephesians. Indeed his whole epistle consists of phrases and sentiments taken from the New Testament. (Jortin's Ecclesiastical Hist. vol. i. p. 68, &c.)

POLYCARPON. All-seed. In botany, a genus of the class triandria, order trigynia. Calyx five-leaved; petals five, ovate, very small; capsule one-celled, three-valved; seeds numerous. One species, *P. tetraphyllum*, found wild on our own coasts.

POLYCHREST, in pharmacy, a medicine that serves for many uses, or that cures many disorders.

POLYCNEMON, in botany, a genus of the class triandria, order monogynia. Calyx three-leaved; petals five, calyx-like; seed one, almost naked. Five species, natives of Siberia.

POLYCOTYLEDONOUS PLANTS. Plants which have more than two cotyledons or lobes to the seed; as pinus, cupressus, linum.

POLYCRATES, a tyrant of Samos, who made himself master not only of the neighbouring islands, but also of some cities on the coast of Asia. He was so universally respected, that Amasis, king of Egypt, made a treaty of alliance with him. The Egyptian monarch, however, advised him to chequer his enjoyments, by relinquishing some of his most favourite objects. Polycrates complied, and threw into the sea a seal, the most valuable of his jewels. The voluntary loss of the seal afflicted him for some time, but a few days after he received as a present a large fish, in whose belly the jewel was found. Some time after, Polycrates visited Magnesia, where he had been invited by Orctes, the governor, who shamefully put him to death, 522 years before Christ, merely because he wished to terminate the prosperity of Polycrates.

POLYDAMAS, a Trojan, son of Antenor, by Theano. He married Lycaste, a natural daughter of Priam, and was accused of having betrayed his country to the Greeks. 2. A son of Panthous, born the same night as Hector. He was inferior to none of the Trojans, except Hector. He was at last killed by Ajax. 3. A celebrated athlete, who imitated Hercules in whatever he did. It is said that he killed a lion with his fist, and that he could stop a chariot with his hand in its most rapid course.

POLYDAMNA, the wife of Thonis, king of Egypt. She gave Helen a certain powder, which had the wonderful power of driving away care.

POLYDECTES, a king of Sparta, of the family of the Proclidæ. He was son of Eunomus. 2. A king of the island of Seriphos. He received with great kindness Danae and her son Perseus, exposed on the sea by Acrisius. (See PERSEUS.) He educated Perseus; but when he became enamoured of Danae, he removed him from his kingdom. Some time after, Danae, having rejected his addresses, fled to the altar of Minerva for protection, and Dictys, the brother of Polydectes, armed himself in her defence. At this critical moment, Perseus arrived, and with Medusa's head, turned into stones Polydectes, with the associates of his guilt.

POLYDIPSIA. (πολυδιψια, from πολυς, much, and διψη, thirst). Excessive thirst. A genus of disease in the class locales, and order dysorexia of Cullen. It is mostly symptomatic of fever, dropsy, excessive discharges, or poisons.

POLYDORE VIRGIL, of Urbino, came to England in the suit of the papal legate. He

so pleased Henry VIII. by his learning that he gave him the archdeaconry of Wells, and prevailed upon him to employ his talents in an history of the country. He afterwards left England in consequence of the conduct of Wolsey, who had imprisoned him for one year, because his patron Corneto had solicited the see of York, and he retired to Italy, where he died 1555. His works are the history of England to the end of the seventh Henry's reign, dedicated to Henry VIII. a work written in elegant Latin, but not very accurate as an history—*de inventoribus rerum*, 12mo.—treatise on prodigies, fol.—correction on Gildas, &c.

POLYDORUS. The most remarkable of this name are the following:—1. A son of Alcamenes, king of Sparta, who put an end to the war which had been carried on during 20 years, between Messenia and his subjects. He was assassinated by a nobleman, called Polemarchus, and his son Eurycrates succeeded him 724 years before Christ. 2. A son of Priam by Hecuba. As he was young when Troy was besieged by the Greeks, his father entrusted him, with the greatest part of his treasures, to Polymnestor, king of Thrace, till his country was freed from invasion. No sooner was the death of Priam known than Polymnestor made himself master of the riches, and assassinated young Polydorus, and threw his body into the sea. (See *HECUBA*.) According to Virgil, the body of Polydorus was buried near the shore, and there grew on his grave a myrtle, whose boughs dropped blood, when Æneas, going to Italy, attempted to tear them from the tree. (See *POLYMNESTOR*.)

POLYEDRICAL. **POLYEDROUS.** *a.* (from *πολυεδρῆς*; *polyedre*, Fr.) Having many sides (*Boyle*, *Woodward*).

POLYEDRON, or **POLYHEDRON**, a solid or body having many sides or faces.

POLYGALA. Milk-wort. In botany, a genus of the class diadelphia, order octandria. Calyx five-leaved, two of them wing-shaped and coloured; legume inversely heart-shaped, two-celled, two-valved. Seventy-six species scattered over the globe, which may be thus subdivided into sections.

A. Flowers with a crest or pencil-like appendage.

B. Flowers not crested; shrubby.

C. Beardless, herbaceous, with the stem quite simple.

D. Bearded, herbaceous, with the stem branched.

The following are most entitled to notice.

1. *P. vulgaris*. Common milk-wort. Found in our pastures, the root similar in taste to *P. seneka*, but much weaker. The leaves are very bitter, and a handful of them infused in wine is said to be a safe and gentle purge.

2. *P. amara*. Bitter milk-wort. Indigenous to the south of Europe, with larger leaves than the preceding. In medicine it has been freely used in phthisis; but where other resources have failed this has not been more suc-

cessful; yet as a palliative it claims attention. Its virtues are balsamic, demulcent, corroborant.

3. *P. Senega*. Rattlesnake-root. A North American plant, with woody, branched, twisted root; stems simple, erect, slender, glabrous, reddish; leaves alternate; flowers white. This was formerly supposed to be an antidote against the bite of the rattlesnake; whence its specific name: it is now used for other medical purposes, for which see the article *SENEGA*.

The two following are cultivated in our gardens.

4. *P. myrtifolia*. Myrtle-leaved milk-wort: with shrubby stem, four or five feet high; leaves oblong, obtuse, glabrous; racemes terminal, few-flowered; flowers crested, large, white without, purple within; keel of the corol falcate. A native of the Cape.

5. *P. chamæbuxus*. Box-leaved milk-wort. Slender branching woody stalk, about a foot high; leaves oblong-lanceolate, acute; peduncles terminal, axillary, one or two-flowered; flowers beardless, white without, purplish intermixed with yellow within. A native of Austria.

P. myrtifolia is best propagated by seeds; *P. chamæbuxus*, by dividing its creeping roots.

POLYGAMA. (*πολυς* and *γάμος*, several marriages.) Polygamous plants. In botany. A polygamous plant is that which has hermaphrodite, and either male or female flowers, or both.

POLYGAMIA. In botany, the name of the twenty-third class in the Linnéan system; comprehending those plants which bear hermaphrodite flowers, accompanied with male or female flowers, or both; not inclosed within the same common calyx, but scattered either on the same plant, or on two, or on three distinct individuals. Whence the three orders of this class. 1. Monœcia. 2. Diœcia. 3. Tricœcia.

Some modern reformers have entirely discarded this class, and thus have simplified the Linnéan arrangement, and rendered it more easy to beginners; but they have at the same time wholly mutilated it, considered as a sexual system. - We may go on reforming till we reduce it to the simplicity of Rivinus's system; when it will acquire great facility, and at the same time become good for nothing.

This term *polygamia* or *polygamy*, as applied to a compound flower, in the orders of the class syngenesia, signifies that several distinct flowers (called florets) are included in one common calyx. These may be all hermaphrodite, as in the first order; or hermaphrodites with female flowers as in the second, third, and fourth.

POLYGAMIST. *s.* (from *polygamy*.) One that holds the lawfulness of more wives than one at a time.

POLYGAMY. *s.* (*polygamie*, Fr. *πολυγαμία*.) A plurality of wives or husbands, in the possession of one man or woman at the same time. Polygamy is so universally esteemed unlawful, and even unnatural, through Europe,

and in all Christian countries, that we have generally reasoned upon this conviction. Both religion and reason appear at first sight at least to condemn it; and with this view of the subject mankind in general rest satisfied: but some bolder geniuses have taken the opposite side of the question; have cast off the prejudices of education, and attempted to show that polygamy is not unlawful, but that it is just and necessary, and would be a public benefit.

One of the most specious writers on this side of the question was Mr. Madan, in his *Thelyphthora*. We shall neither detail his reasonings, nor enter into a laboured refutation of such notions; but simply quote the concluding remarks of the Monthly Reviewer of Madan's work. "In a word," says he, "when we reflect that the primitive institution of marriage limited it to one man and one woman; that this institution was adhered to by Noah and his sons, amidst the degeneracy of the age in which they lived, and in spite of the examples of polygamy which the accursed race of Cain had introduced; when we consider how very few (comparatively speaking) the examples of this practice were among the faithful; how much it brought its own punishment with it; and how dubious and equivocal those passages are in which it appears to have the sanction of divine approbation; when to these reflections we add another, respecting the limited views and temporary nature of the more ancient dispensations and institutions of religion—how often the imperfections and even vices of the patriarchs and people of God in old time are recorded, without any express notification of their criminality—how much is said to be commanded, which our reverence for the holiness of God and his law will only suffer us to suppose were, for wise ends, permitted—how frequently the messengers of God adapted themselves to the genius of the people to whom they were sent, and the circumstances of the times in which they lived:—above all, when we consider the purity, equity, and benevolence of the Christian law; the explicit declarations of our Lord, and his apostle St. Paul, respecting the institution of marriage, its design and limitation;—when we reflect, too, on the testimony of the most ancient fathers, who could not possibly be ignorant of the general and common practice of the apostolic church; and, finally, when to these considerations we add those which are founded on justice to the female sex, and all the regulations of domestic economy and national policy—we must wholly condemn the revival of polygamy; and thus bear our honest testimony against the leading design of this dangerous and ill-advised publication."

We would advise our readers to read the whole criticism on Madan's book in the Monthly Review, together with their account of the several answers to it. The reverend author of the *Thelyphthora* has here met with a most able antagonist, who traces him through all his deceitful windings, and exposes the futi-

lity and falsehood of his arguments with singular ability. See Monthly Review, vol. lxiii. p. 273, &c.; see also Paley's *Moral Philosophy*.

It has been disputed by the lawyers, whether polygamy be adultery. In the Roman law it is called *stuprum*, and punished as such, that is, in some cases, capitally. But a smaller punishment is more consistent with the Jewish law, wherein the prohibition of adultery is perpetual, but that of polygamy temporary only.

In Germany, Holland, and Spain, this offence is differently punished. By a constitution of Charles V. it was a capital crime. By the laws of ancient and modern Sweden it is punished with death. In Scotland it is punished as perjury.

In England it is enacted by statute 1 Jac. I. cap. 11: that if any person, being married, do afterwards marry again, the former husband or wife being alive, it is felony, but within the benefit of clergy. The first wife in this case shall not be admitted as an evidence against her husband, because she is the true wife; but the second may, for she is indeed no wife at all; and so *vice versa* of a second husband. This act makes an exception to five cases, in which such second marriage, though in the three first it is void, is, however, no felony. 1. Where either party hath been continually abroad for seven years, whether the party in England had notice of the other's being living or not. 2. Where either of the parties hath been absent from the other seven years within this kingdom, and the remaining party hath had no notice of the other's being alive within that time. 3. Where there is a divorce or separation *a mensa et thoro* by sentence in the ecclesiastical court. 4. Where the first marriage is declared absolutely void by any such sentence, and the parties loosed *a vinculo*. Or, 5. Where either of the parties was under the age of consent at the time of the first marriage; for in such case the first marriage was voidable by the disagreement of either party, which this second marriage very clearly amounts to. But if at the age of consent the parties had agreed to the marriage, which completes the contract, and is indeed the real marriage, and afterwards one of them should marry again, judge Blackstone apprehends that such second marriage would be within the reason and penalties of the act.

POLYGARS, are natives of Hindustan. They inhabit almost impenetrable woods, and are under the absolute direction of their own chieftains. In time of peace they are professionally robbers, but in times of war are the guardians of the country. The general name of these people is Polygar. Their original institution, for they live in distinct clans, is not very well understood. It probably took its rise from the municipal regulations relative to the destruction of tygers and other ferocious beasts. Certain tracts of woodland were indisputably allotted as rewards to those who

should slay a certain number of those animals; and those lands approximating, probably laid the foundation of the several confederacies of Polygars.

POLYGLOTT, Πολυγλωττος, thus called from πολυ, and γλωττα, tongue, language, among divines and critics, chiefly denotes a Bible printed in several languages.

This interesting subject cannot be treated with the fulness it merits, without drawing us beyond our assigned limits. We therefore beg leave to refer the critical reader to the valuable accounts in Dr. Adam Clarke's Bibliographical Dictionary, and in Dibdin's Introduction to the Classics.

POLYGNOTUS, a celebrated painter of Thasos, about 422 years before the Christian era. He adorned one of the public porticoes of Athens with his paintings, and particularly excelled in giving liveliness and expression to his pieces.

POLYGON, Πολυγωνος, formed from πολυς many, and γωνια, angle, in geometry, a multilateral figure, or a figure whose perimeter consists of more than four sides and angles. If the angles be all equal among themselves, the polygon is said to be a regular one; otherwise, it is irregular. Polygons also take particular names according to the number of their sides; thus a Polygon of

3 sides is called a trigon,

4 sides is called a tetragon,

5 sides is called a pentagon,

6 sides is called a hexagon, &c.

and a circle may be considered as a polygon of an infinite number of small sides, or as the limit of the polygons.

Polygons have various properties, as below:

1. Every polygon may be divided into as many triangles as it hath sides.

2. The angles of any polygon taken together, make twice as many right angles, wanting 4, as the figure hath sides. Thus, if the polygon has 5 sides; the double of that is 10, from which subtracting 4, leaves 6 right angles, or 540 degrees, which is the sum of the 5 angles of the pentagon. And this property, as well as the former, belongs to both regular and irregular polygons.

3. Every regular polygon may be either inscribed in a circle, or described about it. But not so of the irregular ones, except the triangle, and another particular case as in the following property.

An equilateral figure inscribed in a circle is always equiangular.—But an equiangular figure inscribed in a circle is not always equilateral, but only when the number of sides is odd. For if the sides be of an even number, then they may either be all equal, or else half of them may be equal, and the other half equal to each other, but different from the former half, the equals being placed alternately.

4. Every polygon, circumscribed about a circle, is equal to a right-angled triangle, of which one leg is the radius of the circle, and the other the perimeter or sum of all the sides

of the polygon. Or the polygon is equal to half the rectangle under its perimeter and the radius of its inscribed circle, or the perpendicular from its centre upon one side of the polygon.

Hence, the area of a circle being less than that of its circumscribing polygon, and greater than that of its inscribed polygon, the circle is the limit of the inscribed and circumscribed polygons: in like manner the circumference of the circle is the limit between the perimeters of the said polygons: consequently the circle is equal to a right-angled triangle, having one leg equal to the radius, and the other leg equal to the circumference; and therefore its area is found by multiplying half the circumference by half the diameter. In like manner, the area of any polygon is found by multiplying half its perimeter by the perpendicular admitted from the centre upon one side.

5. The following table exhibits the most remarkable particulars in all the polygons, up to the dodecagon of 12 sides, viz. the angle at the centre, the angle of the polygon, and the area of the polygon when each side is 1. See fig. 7. pl. 139.

No. of sides.	Name of polygon.	Ang. F. at cent.	Ang. C. of polyg.	Area
3	Trigon	120°	60°	0.4330127
4	Tetragon	90	90	1.0000000
5	Pentagon	72	108	1.7204774
6	Hexagon	60	120	2.5980762
7	Heptagon	51 $\frac{3}{4}$	128 $\frac{1}{2}$	3.6539124
8	Octagon	45	135	4.8284271
9	Nonagon	40	140	6.1818242
10	Decagon	36	144	7.6942088
11	Undecagon	32 $\frac{2}{11}$	147 $\frac{3}{11}$	9.3656399
12	Dodecagon	30	150	11.1961524

Problem concerning polygons. 1. On a regular polygon to circumscribe a circle, or to circumscribe a regular polygon upon a circle. Bisect two of the angles of the given polygon A and B by the right lines AF, BF; and on the point F, where they meet, with the radius AF, describe a circle which will circumscribe the polygon. Next to circumscribe a polygon, divide 360 by the number of sides required, to find $e F d$; which set off from the centre F, and draw the line de , on which construct the polygon as in the following problem. 2. On a given line to describe any given regular polygon. Find the angle of the polygon in the table, and in E set off an angle equal thereto; then drawing $EA = ED$, through the points E, A, D, describe a circle, and in this applying the given right line as often as you can, the polygon will be described. 3. To find the sum of all the angles in any given regular polygon. Multiply the number of sides by 180° ; from the product subtract 360° , and the remainder is the sum required: thus, in a pentagon, $180 \times 5 = 900$, and $900 - 360 = 540 =$ the sum of all the angles in a pentagon.

To find the area of any regular polygon.—Multiply the square of its side by the tabular area, found on the line of its name in the last column of the table, and the product will be the area. Thus, to find the area of the trigon, or equilateral triangle, whose side is 20. The square of 20 being 400, multiply the tabular area .4330127 by 400, as in the margin, and the product 173.2050800 will be the area.

$$\begin{array}{r} 0.4330127 \\ \times 400 \\ \hline 173.2050800 \end{array}$$

There are several curious algebraical theorems for inscribing polygons in circles, or finding the chord of any proposed part of the circumference, which is the same as angular sections. These kinds of sections, or parts and multiplies of arcs, were first treated of by Vieta, as shewn in the Introduction to Hutton's Log. pa. 9. and since pursued by several other mathematicians, in whose works they are usually to be found.

POLYGON, in fortification, denotes the figure or perimeter of a fortress, or fortified place. This is either exterior or interior.

Exterior polygon, is the perimeter or figure formed by lines connecting the points of the bastions to one another, quite round the work. And

Interior polygon, is the perimeter or figure formed by lines connecting the centres of the bastions, quite around.

POLYGONS (Line of), is a line on some sectors, containing the homologous sides of the first nine regular polygons inscribed in the same circle; viz, from an equilateral triangle to a dodecagon.

POLYGONAL NUMBERS, are the continual or successive sums of a rank of any arithmeticals beginning at 1, and regularly increasing; and therefore are the first order of figurate numbers: they are called Polygons, because the number of points in them may be arranged in the form of the several polygonal figures in geometry, as is illustrated under the article FIGURATE NUMBERS, which see.

The several sorts of polygonal numbers, viz. the triangles, squares, pentagons, hexagons, &c. are formed from the addition of the terms of the arithmetical series, having respectively their common difference 1, 2, 3, 4, &c.; viz. if the common difference of the arithmeticals be 1, the sums of their terms will form the triangles; if 2, the squares; if 3, the pentagons; if 4, the hexagons, &c. Thus:

- { Arith. progres. 1, 2, 3, 4, 5, 6, 7.
- { Triang. nos. 1, 3, 6, 10, 15, 21, 28.
- { Arith. progres. 1, 3, 5, 7, 9, 11, 13.
- { Square nos. 1, 4, 9, 16, 25, 36, 49.
- { Arith. progres. 1, 4, 7, 10, 13, 16, 19.
- { Pentag. nos. 1, 5, 12, 22, 35, 51, 70.
- { Arith. progres. 1, 5, 9, 13, 17, 21, 25.
- { Hexag. nos. 1, 6, 15, 28, 45, 66, 91.

The side of a polygonal number is the number of points in each side of the polygonal

figure when the points in the number are ranged in that form. And this is also the same as the number of terms of the arithmeticals that are added together in composing the polygonal number; or, in short, it is the number of the term from the beginning. So, in the 2d or squares,



the side of the first (1) is 1, that of the second (4) is 2, that of the third (9) is 3, that of the fourth (16) is 4, and so on. And

The angles, or numbers of angles, are the same as those of the figure from which the number takes its name. So the angles of the triangular numbers are 3, of the square ones 4, of the pentagonals 5, of the hexagonals 6, and so on. Hence, the angles are 2 more than the common difference of the arithmetical series from which any rank of polygons is formed: so the arithmetical series has for its common difference the number 1 or 2 or 3, &c. as follows, viz. 1 in the triangles, 2 in the squares, 3 in the pentagons, &c.; and, in general, if a be the number of angles in the polygon, then $a-2$ is d the common difference of the arithmetical series, or $d+2=a$ the number of angles.

PROB. 1.—To find any polygonal number proposed; having given its side n and angles a . The polygonal number being evidently the sum of the arithmetical progression whose number of terms is n and common difference $a-2$, and the sum of an arithmetical progression being equal to half the product of the extremes by the number of terms, the extremes being 1 and $1+d$. $(n-1) = 1 + (a-2) \cdot (n-1)$; therefore that number, or this sum, will be $\frac{n^2 d - n \cdot (d-2)}{2} = \frac{n^2 (a-2) - n \cdot (a-4)}{2}$, where

d is the common difference of the arithmeticals that form the polygonal number, and is always 2 less than the number of angles a .

Hence, for the several sorts of polygons, any particular number whose side is n , will be found from either of these two formulæ, by using for d its values 1, 2, 3, 4, &c.; which gives these following formulæ for the polygonal number in each sort, viz. the

$$\begin{aligned} \text{Triangular} &= \frac{n^2 + n}{2}, \\ \text{Square} &= \frac{2n^2 - 0n}{2} = n^2, \\ \text{Pentagonal} &= \frac{3n^2 - n}{2}, \\ \text{Hexagonal} &= \frac{4n^2 - 2n}{2}, \end{aligned}$$

$$\text{Heptagonal} - \frac{5n^2 - 3n}{2},$$

&c.

PROB. 2.—To find the sum of any number of polygonal numbers of any order.—Let the angles of the polygon be a , or the common difference of the arithmeticals that form the polygonals, d ; and n the number of terms in the polygonal series, whose sum is sought; then is

$$\left(\frac{n^2-1}{6}d + \frac{n+1}{2}\right)n \text{ or } \left(\frac{n^2-1}{6} \cdot a - 2 + \frac{n+1}{2}\right)n$$

the sum of the n terms sought.

Hence, substituting successively the numbers 1, 2, 3, 4, &c. for d , there is obtained the following particular cases, or formulæ, for the sums of n terms of the several ranks of polygonal numbers, viz. the sum of the

$$\text{Triangulars} - \frac{n^2 + 3n + 2}{6} n,$$

$$\text{Squares} - \frac{2n^2 + 3n + 1}{6} n,$$

$$\text{Pentagonals} - \frac{3n^2 + 3n + 0}{6} n,$$

$$\text{Hexagonals} - \frac{4n^2 + 3n - 1}{6} n,$$

$$\text{Heptagonals} - \frac{5n^2 + 3n - 2}{6} n,$$

(Hutton's Math. Dict.)

POLYGONOMETRY, the measure or doctrine of polygons. For a brief treatise on this subject, see the 3d vol. of Dr. Hutton's Course of Mathematics.

POLYGONOUS STEM, in botany, a many-angled stem. Having several (more than six) prominent longitudinal angles. Delin. Pl. But in Philos. Bot. it is a species of aneups. Multangular is explained in Delin. Pl. to be excavated longitudinally by several hollow angles. According to this explanation, therefore, the former term refers to the angles in cameo, the second to those in intaglio. But in Philos. Bot. the multangular stem is said to have several prominent angles.

POLYGONUM, in botany, a genus of the class octandria, order trigynia. Calyx five-parted, coloured, resembling a corol, permanent; corollæ; seed one, superior, angular, covered with the calyx; stamens and pistils irregular in number. Forty-two species, scattered over Europe, Asia, and America, of which ten are common to our own country. They may be thus subdivided into sections.

A. Stem shrubby; forming the atraphaxoides of many writers.

B. With a single spike; embracing the family of bistorts.

C. With bifid pistil, or stamens fewer than eight: the family of persicarias.

D. With undivided leaves and eight stamens. Proper polygonums.

E. With leaves somewhat heart-shaped: the tribe of helxine.

The following are chiefly entitled to notice.

1. *P. bistorta*. Bistort. Found wild in our pastures, and employed as a styptic in medicine. See **BISTORTA**.

2. *P. orientale*. Arsmath. Oriental persicary. Root tufted, fibrous; stem erect, jointed, hairy, eight or ten feet high; leaves alternate, ovate, often a foot long, and six inches broad in the middle; flowers in long, terminating spikes, pendulous; stamens five, six or seven. A native of India, flowering from July to October: easily raised from seeds; and supposed to arise from scattered seeds more readily than from those that are sown. This is the only cultivated species of the whole genus; but it has a dwarf variety that is also cultivated.

3. *P. aviculare*. Knot-grass. Found in the wastes of our own country, with leaves short, long, oblong, or linear, procumbent, herbaceous stem. It is used in some countries medicinally under the name of **CENTURNODIA**, which see.

4. *P. fagopyrum*. Buck-wheat. Brank. Found in our cultivated fields; rises with an upright, smooth, branchy stem, from about a foot to half a yard high; leaves heart-arrow-shaped; branches terminated by clusters of whitish flowers; seeds with even angles: an excellent food for pigeons and other poultry.

POLYGRAM. *s.* (πολυς αἰά γραμμα.) A figure consisting of a great number of lines.

POLYGRAPHY. *s.* (πολυς and γραφν.) The art of writing in several unusual manners of ciphers; as also deciphering the same.

POLYGYNY. (πολυς, and γυν, a wife.) The name of one of the orders in the fifth, sixth, twelfth, and thirteenth classes of the Linnæan system; comprehending those plants which have flowers with many pistils.

POLYHEDRON, or **POLYEDRON**, a body or solid contained by many rectilinear planes or sides.

When the sides of the polyhedron are regular polygons, all similar and equal, then the polyhedron becomes a regular body, and may be inscribed in a sphere; that is, a sphere may be described about it, so that its surface shall touch all the angles or corners of the solid. There are but five of these regular bodies, viz. the tetraedron, the hexaedron or cube, the octaedron, the dodecaedron, and the icosaedron. See **REGULAR BODY**, and each of those five bodies severally.

POLYHEDRON (Gnomonical), is a stone with several faces, on which are projected various kinds of dials. Of this sort, that in the Privy-garden, London, now gone to ruin, was esteemed the finest in the world.

POLYHYMNIA and **POLYMNIA**, one of the Muses, daughter of Jupiter and Mnemosyne. She presided over singing and rhetoric, and was deemed the inventress of harmony.

POLYLOGY. *s.* (πολυς and λογος.) Talkativeness.

POLYMATHY. *s.* (πολυς and μαθανω.)

The knowledge of many arts and sciences; also an acquaintance with many different subjects.

POLYMEDE, a daughter of Autolycus, who married *Æson*, by whom she had Jason. She survived her husband only a few days.

POLYMELA, one of Diana's companions, daughter of Phylas. She had a son by Mercury.

POLYMNESTOR, a king of the Thracian Chersonesus, who married *Hione*, the eldest of Priam's daughters. When the Greeks besieged Troy, Priam sent the greatest part of his treasures, together with Polydorus, the youngest of his sons, to Thrace, entrusted to the care of Polymnestor, who, when informed that Priam was dead, murdered his brother-in-law to become master of the treasures. At that time the Greeks were returning victorious from Troy, followed by all the captives, among whom was Hecuba, the mother of Polydorus. The fleet stopped on the coasts of Thrace, where one of the female captives discovered on the shore the body of Polydorus, whom Polymnestor had thrown into the sea. Hecuba and her captive associates, for this act of cruelty and perfidy, put out the eyes of the tyrant, and murdered his two children. (*Euripid. Virg. Ovid, &c.*) Hyginus relates the story in a different manner.

POLYMNIA, in botany, a genus of the class syngenesia, order polygamia necessaria. Receptacle chaffy; downless; calyx double, the outer four or five-leaved; inner ten-leaved, leaves concave. Three species; natives of America or Abyssinia.

POLY (Mountain). See **TEUCRIUM**.

POLYNEMUS. Polyneme. In zoology, a genus of the class pisces, order abdominalia. Head compressed, covered with scales; snout very obtuse and prominent; gill-membrane from five to seven-rayed; pectoral fins with distinct appendages. Four species; three inhabitants of America, one of the Pacific Ocean. They are chiefly distinguished from the genus *trigla*, in having the ventral fins placed on the abdomen, and in the appendages not being articulate. Their bodies are oblong, thick, and covered with scales; as is also the head, which slopes off into an obtuse snout. The jaws are of equal length when open; but when shut, the lower is longest; both are furnished with small, thick, and immoveable teeth. The tongue is narrow and smooth; but the palate is armed with a number of sharp tubercles. The eyes are of a middle size, placed at a great distance from each other, and covered with the common tegument of the head; before them appear the two large apertures of the nose.

The sides are compressed, and the abdomen carinated; each of the lateral lines are smooth, and bend in a direction parallel to the back. There are two dorsal fins; the first spinous, and placed about the fish's equilibrium; the second, which is larger, behind it. The pectoral fins are long and narrow; the ventral are

placed in the abdomen; the tail is large, broad, and bifurcated.

We shall offer a specimen or two:

1. *P. paradiseus*. Mango-fish. Appendages seven; tail forked. The colour is yellowish, resembling that of a ripe mango; whence its specific name. It is an inhabitant of the Indian and American seas; about twelve or fifteen inches long. At Calcutta its flesh is accounted delicate.

2. *P. plebeius*. Grey polyneme. Appendages five, the first extending beyond the tail, the others gradually shortening. Inhabits the Pacific Ocean, and has the general appearance of a mullet, but with the head very obtuse in front, the mouth seeming to be placed beneath. Each of these species appears to have varieties, which some writers have made distinct species.

Mr. Bruce, in the appendix to his travels, gives a drawing and an account of a fish, which he conceives should belong to this genus, and which is hence denominated *P. niloticus*. We have some doubts, however, whether this fish is properly arranged. The specimen this traveller saw taken in the Nile weighed thirty-two pounds; and he adds, that it often reaches the weight of seventy pounds, and inhabits the Nile as high up as Syene and the first cataract. The whole body is covered with scales of a brilliant silver colour, so as to resemble an assemblage of spangles; the nose has a shade of red at the end, which is the only variety of colour the fish exhibits.

POLYNICES, a son of *Cedipus*, king of Thebes, by *Jocasta*. He inherited his father's throne with his brother *Eteocles*, and it was mutually agreed between them, that they should reign each a year alternately. *Eteocles* first ascended the throne, but, when the year was expired, he refused to resign the crown to his brother. *Polynices*, upon this, fled to Argos, where he married *Argia*, the daughter of *Adrastus*, the king of the country, and levied a large army, at the head of which he marched against Thebes. The command of this army was divided among seven celebrated chiefs, who were to attack the seven gates of the city of Thebes. The battle was decided by a single combat between the two brothers, who each killed the other.

POLYPE, in helminthology. See **HYDRA**.

POLYPETALOUS COROL. In botany. A polypetalous corolla; or, a corol of many petals. Linnéus uses this term in opposition to a monopetalous corol; that is, consisting of one petal only. By former writers it was commonly put for a flower of more than six petals; and Linnéus uses the terms *monopetala*, *dipetala*, &c.

POLYPHEMUS, in fabulous history, king of all the Cyclops in Sicily, and son of *Nephtune* and *Thoosa*. He is represented as a monster of immense strength, and with one eye in the middle of the forehead. He fed upon human flesh, and kept his flocks on the

coasts of Sicily, when Ulysses, at his return from the Trojan war, was driven there. The Grecian prince, with twelve of his companions, visited the coast, and were seized by the Cyclops, who daily devoured two of them in his cave, in which they were confined. Ulysses would have shared the same fate had he not intoxicated the Cyclops, and put out his eye with a firebrand while asleep. Polyphemus, awaked by the sudden pain, stopped the entrance of his cave, but Ulysses made his escape by creeping between the legs of the rams of the Cyclops, which had been put up in the cave. Polyphemus became enamoured of Galatæa, but his addresses were disregarded, and the nymph shunned his presence. The Cyclops, when he saw Galatæa surrender herself to the pleasures of Acis, crushed his rival with a piece of a broken rock.

POLYPHONISM. *s.* (πολύς and φωνή.) Multiplicity of sound (*Derham*).

POLYPHYLLOUS, in botany, many-leaved. Applied to the calyx, perianth, involucre, and cirrus or tendril; in opposition to monophyllous, one-leaved. Here also Linnæus uses diphyllus, triphyllus, &c.

POLYPODIUM. Polypody. In botany, a genus of the class cryptogamia, order filices. Fructification in roundish, scattered dots, not marginal; involucreless. Seventy-six species, five indigenous. They may be thus subdivided into sections.

- A. Frond simple.
- B. Frond pinnatifid.
- C. Frond pinnate.
- D. Frond doubly pinnatifid or doubly pinnate.
- E. Frond more than decomposed.

The following are chiefly entitled to notice.

1. *P. vulgare*. Common polypody. Segments linear, oblong, obtuse, slightly serrate; not scaly. The leaves have a weak ungrateful smell, and a nauseous sweet taste, leaving a kind of roughness and slight acrimony in the mouth. They give out their smell and taste, together with a yellow colour, both to water and rectified spirit. The spirituous tincture is sweeter than the watery; but in inspissation its sweetness is in great part destroyed, or covered by the other matter; the spirituous extract, as Cartheuser observes, being to the taste only subadstringent and subacid, with very little sweetness, while the watery extract retains the full sweetness of the polypody. A native of our own country.

2. *P. quercanum*. Oak polypody. Futile; fronds pinnatifid, with lanceolate segments; barren ones sessile, ovate, sinuate. The root of this fern grows on the oak, whence its specific name; it was employed by the ancients as a purgative, and thought to be peculiarly useful in expelling bile and pituitous humours, therefore much used in maniacal and melancholic disorders; but, to act as a cathartic, the root must be exhibited in its recent state, and in a large dose. Another character in which it has been recommended, and for

which, from its sensible qualities, it seems to promise more advantage, is that of a demulcent or pectoral; thus, joined with liquorice, its good effects have been experienced in coughs and asthmatic affections. However, it is now rarely used in this country, nor have the French authors, Poissoner and Malouin, who have cited instances of its success in mania, been able to restore to it its ancient reputation in this calamitous disorder.

3. *P. filix mas*. Male polypody. Divisions pinnate; subdivisions oblong, obtuse, serrate at top; stalk scaly. Indigenous to our own country. It is often burnt for the sake of its alkaline ashes, which are bought by the soap-makers and glass manufacturers. The Norwegians are said to boil and eat it as asparagus, and to give it in the same state to their cattle as fodder. In medicine it has been long employed as a vermifuge under its specific name of *FILIX MAS*, which see.

POLYPOUS. *a.* (from *polypus*.) Having the nature of a polypus; having many feet or roots (*Arbutnot*).

POLYPREMIUM, in botany, a genus of the tetandria monogynia class and order. Natural order of Caryophyllei. Scrophulariæ, Jussieu. Essential character: calyx four-leaved; corolla four-cleft; wheel-shaped, with obcordate lobes; capsule compressed, emarginate, two-celled. There is but one species, viz. *P. procumbens*, a native of Carolina and Virginia.

POLYPUS. (πολύπους; from πολύς, many, and πούς, a foot, from its sending off many ramifications like legs.) This term is generally given to a sarcomatous substance that frequently arises in the nostrils, uterus, &c. from its having many attachments or roots. They vary from each other according to the different causes that produce them, and the alterations that happen in them. Sometimes a polypus is owing to a swelling of the pituitary membrane, which swelling may possess a greater or less space of the membrane, as also its cellular substance, and may affect either one or both nostrils. At other times it arises from an ulcer produced by a caries of some of the bones which form the internal surface of the nostrils. Polypuses are sometimes so soft, that upon the least touch they are lacerated, and bleed; at other times they are very compact, and even scirrhous. Some continue small a great while; others increase so fast as in a short time to push out at the nostrils, or extend backward towards the throat. Le Dran mentions, that he has known them fill up the space behind the uvula, and turning towards the mouth, have protruded the fleshy arch of the palate so far forwards as to make it parallel with the third dentes molares. There are others, which, though at first free from any malignant disposition, become afterwards carcinomatous, and even highly cancerous. Of whatever nature the polypus is, it intercepts the passage of the air through the nostril, and, when large, forces the septum narium into the other nostril,

so that the patient is unable to breathe, unless through the mouth. A large polypus pressing in like manner upon the spongy bones, gradually forces them down upon the maxillary bones, and thus compresses and stops up the orifice of the ductus lachrymalis; nor is it impossible for the sides of the canalis nasalis to be pressed together. In which case, the tears having no passage through the nose, the eye is kept constantly watering, and the sacculus lachrymalis not being able to discharge its contents, is sometimes so much dilated, as to form what is called a flat fistula.

The coagulable substance which is found in the cavities of the heart of those who are some time in *articulo mortis*, is improperly called a polypus.

POLYPUS, in zoology. See **HYDRA**.

POLYSARCIA. (*πολυσαρκία*, from *πυλός*, much, and *σάρξ*, flesh.) Troublesome corpulency or fatness. A genus of disease in the class cachexiæ and order intumescentiæ of Cullen.

POLYSCOPE, or **POLYHEDRON**, in optics, is a multiplying glass, being a glass or lens which represents a single object to the eye as if it were many. It consists of several plane surfaces, disposed into a convex form, through every one of which the object is seen.

POLYSPAST: *s.* (*polyspaste*, French.) A machine consisting of many pulleys.

POLYSPERMOUS CAPSULE or **BERRY**. A many-seeded capsule or berry, containing several seeds.

POLYSTACHYOUS CULM. A culm bearing several spikes. As in *scirpus lacustris*, *holoschœnus*, and *setaceus*.

POLYSTRATUS, a Macedonian soldier, who found Darius after he had been stabbed by Besus, and who gave him water to drink, and carried the last injunctions of the dying monarch to Alexander.

POLYSYLLABICAL. *a.* (from *polysyllable*.) Having many syllables; pertaining to a polysyllable.

POLYSYLLABLE. *s.* (*πολυς* and *συλλαβή*.) A word of many syllables (*Holder*).

POLYSYNDETON. *s.* (*πολυσυνδeton*.) A figure of rhetoric by which the copulative is often repeated: as, I came, and saw, and overcame.

POLYTRICHUM. Golden maidenhair. In botany, a genus of the class cryptogamia, order musci. Capsule oblong or quadrangular; fringe simple, of thirty-two or sixty-four short incurved teeth, connected at top by a flat membrane; veil hairy, often double. Twenty-six species, half indigenous. They may be thus subdivided:

A. Stemless or nearly so.

B. Stem simple.

C. More or less branched.

Of these *P. commune* is the only one we can notice: it is frequently found in our bogs with linear-lanceolate, acute, serrulate, spread leaves; capsule square, on a roundish receptacle. It grows in patches, and its stalks run

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from three inches to a foot or even a yard high. In England it is sometimes employed to make brooms or brushes, and in Lapland to make their beds. The mode in which this bed is manufactured is curious. They cut an entire patch of turf large enough for this purpose, with the fern still growing upon it; this constitutes the bed, and the covering or counterpane is formed by another patch of turf equally covered with this fern, and this they throw over themselves by inverting it, so that they sleep soundly in the middle of the two layers of the fern.

POLYTHEISM. (from *πολυ*, much, and *θεος*, *deus*.) The doctrine or belief of a plurality of gods. See **GOD**, **IDOLATRY**, **JUPITER**, &c.

POLYTHEIST. *s.* (*πολυς* and *θεος*.) One that holds plurality of gods (*Duncomb*).

POLYXENA, a daughter of Priam and Hecuba, celebrated for her beauty. Achilles became enamoured of her, and their marriage would have been consummated, had not Hector, her brother, opposed it. Polyxena, it is said, accompanied her father when he went to the tent of Achilles to redeem the body of Hector. Some time after, Achilles came into the temple of Apollo to obtain a sight of the Trojan princess, but he was murdered there by Paris; and Polyxena was so afflicted at his death, that she sacrificed herself on his tomb. Some say that the princess, who was in the number of the captives, was dragged to her lover's tomb, and there immolated by Neoptolemus, the son of Achilles.

POLYXO, a native of Argos, who married Tlepolemus, son of Hercules. She followed him to Rhodes after the murder of his uncle Lycymnius, and when he departed for the Trojan war with the rest of the Greek princes, she became the sole mistress of the kingdom. After the Trojan war Helen fled from Peloponnesus to Rhodes, where Polyxo reigned. Polyxo detained her, and to punish her, as being the cause of a war in which Tlepolemus had perished, she ordered her to be hanged on a tree by her female servants, disguised in the habit of Furies. See **HELENA**.

POMACEÆ, in botany, the name of the thirty-seventh order in Linnæus's fragments, and of the thirty-sixth in his natural orders. Comprehending such plants as bear a pome, or fruit resembling the apple.

POMACEOUS. *a.* (from *pomum*, Latin.) Consisting of apples (*Philips*).

POMADE. *s.* (*pomade*, Fr. *pomado*, Ital.) A fragrant ointment.

POMANDER. *s.* (*pomme d'ambre*, Fr.) A sweet ball; a perfumed ball or powder (*Shakspeare*).

POMATUM. *s.* (Latin.) An ointment, scented to rub on the head.

To POME. *v. n.* (*pommer*, Fr.) To grow to a round head like an apple.

POME. (*pomum*.) In botany. Pericarpium factum e valve, capsulam continens. A pulpy pericarp, without valves, containing a

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capsule. It includes all the moist fruits which have the seeds lodged in a core; as, apple, pear, quince, &c.

POMEGRANATE. See **GRANATUM** and **PUNICA**.

POMERANIA, a duchy of Germany, in the circle of Upper Saxony; bounded on the N. by the Baltic, on the E. by Western Prussia and Poland, on the S. by Brandenburg, and on the W. by Mecklenburg. It is watered by several rivers, of which the Oder, Recknitz, Pene, Ucker, Rega, Persanet, Wipper, Ihna, Stolpen, and Lebo, are the most considerable. The air is pretty cold, but compensated by the fertility of the soil, which abounds in pastures and corn, of which a great deal is exported. It is a flat country, containing many lakes, woods, and forests, and has several good harbours, particularly Stetin and Stralsund. It is 250 miles long and 75 broad, and divided into Hither and Further Pomerania. The latter and part of Hither Pomerania belong to the king of Prussia; the remainder to the king of Sweden. Stetin is the capital of the Prussian part, and Stralsund of the Swedish.

POMERELIA, a district of Polish or Western Prussia, forcibly seized by the king of Prussia. Danzig is the capital.

POMESANIA, a large county of Western Prussia, which extends from E. to W. from the Passarge as far as the Vistula, between E. and W. Prussia. It is full of lakes and morasses.

POMETIA, in botany, a genus of the class monœcia, order hexandria. Calyx one-leaved, six-cleft; petals six. Male: filaments six, on the margin of the nectary. Female: berry globular, with a single seed in the centre. Two species; natives of New South Wales.

POMEY (Francis), a jesuit of Lyons, known by his *Panthœum Mysticum*, translated into English by Andrew Tooke, as his own performance. He wrote besides a French and Latin Dictionary, 4to.—*Flos Latinitatis*—*Libitina*, on the Funerals of the Ancients—*Novus Rhetoricæ Candidatus*; and died, 1673, aged 55.

POMFRET (John), an English poet, born about 1667, at Luton, Bedfordshire. He was educated at Cambridge, and obtained the living of Maldon, in Bedfordshire. In 1703 he came to London for a larger living, but found bishop Compton strongly prejudiced against him, for four lines in his poem called *Choice*, in which it was falsely said, that he preferred a mistress to a wife, and before the prelate's scruples could be removed, the unfortunate candidate caught the small-pox, and died of it, aged 35. In his *Cruelty and Lust*, he has introduced the character of Kirk with great effect and pathos. No poem, says Johnson, has been oftener perused than his *Choice*. He pleases many, and he who pleases must have merit.

POMIFEROUS. *a.* (*pomifer*, Latin.) A

term applied to plants which have the largest fruit, and are covered with a thick hard rind.

PO'MMEL. *s.* (*pomeau*, Fr.) 1. A round ball or knob (*Sidney*). 2. The knob that balances the blade of the sword (*Sidney*). 3. The protuberant part of a saddle before.

To Po'MMEL. *v. a.* (*pommeler*, Fr. *to va-riegate*.) To beat with any thing thick or bulky; to beat black and blue; to bruise; to punch.

POMMEREULLIA, in botany, a genus of the class triandria, order monogynia. Calyx turbinate, two-valved, three or four flowered; valves four-cleft, awned at the back; corol two-valved, awned. One species; a small Indian grass, with flowers like the shuttlecock.

POMONA, a nymph at Rome who was supposed to preside over gardens, and to be the goddess of all sorts of fruit-trees. She had a temple at Rome, and a regular priest called *Flamen Pomonalis*, who offered sacrifices to her divinity for the preservation of fruit. She was generally represented as sitting on a basket full of flowers and fruit, and holding a bough in one hand, and apples in the other. Many of the gods of the country endeavoured to gain her affection, but Vertumnus was the only one who prevailed upon her to marry him. This deity was unknown among the Greeks.

POMONA, the principal of the Orkney Islands. See **MAINLAND**.

POMP. *s.* (*pompa*, Latin.) 1. Splendour; pride (*Shakspeare*). 2. A procession of splendour and ostentation (*Addison*).

POMPADOUR (Jane Antoinette Poisson, marchioness of), the mistress of Louis XV. was daughter of a financier, and married D'Etiole. The licentious monarch first saw her while he was hunting in the forest of Senar, and from that time he made her his favourite, and raised her, in 1745, to the rank of a marchioness. She enjoyed great influence at court till her death, 1764, at the age of 44. The liberal manner with which she patronized literature has in some degree blunted the shafts of criticism against the infamy of her life. Her memoirs have been published, 2 vols. 8vo. and all her letters, 3 vols.

POMPEIA. The most remarkable of this name was a daughter of Pompey the Great, Julius Cæsar's third wife. She was accused of incontinence, because Clandius had introduced himself in women's clothes into the room where she was celebrating the mysteries of Cybele. Cæsar repudiated her upon this accusation.

POMPEIANUS. The most remarkable of this name is a Roman knight of Antioch, raised to offices of the greatest trust, under the emperor Aurelius, whose daughter, Lucilla, he married. He lived in great popularity at Rome, and retired from the court when Commodus succeeded to the imperial crown.

POMPEII, or **POMPEIUM**, a town of

Campania, partly demolished by an earthquake, A. D. 63, and afterwards rebuilt. Sixteen years after it was swallowed up by another earthquake, which accompanied one of the eruptions of mount Vesuvius. Herculaneum was destroyed at the same time.

POMPEIOPOLIS, a town of Cilicia, formerly called Soli.

POMPEIUS. Pompey. This name was common to many illustrious Romans, the most celebrated of whom is Cneus, surnamed Magnus, from the greatness of his exploits. He was son of Pompeius Strabo, and Lucilia. He early distinguished himself in the field, under his father, whose courage and military prudence he imitated. He began his career with great popularity, and in pleading at the bar he received unbounded applause. In the disturbances of Marius and Sylla, Pompey followed the interest of the latter; and in the 26th year of his age he conquered Sicily, and in forty days he regained that part of Africa which had forsaken the interest of Sylla. This rapid success astonished Sylla, who dreading the rising power of Pompey, recalled him to Rome. Pompey obeyed, and the dictator at his return saluted him with the appellation of *the Great*. Having obtained a triumph, though only a Roman knight, he now appeared not as a dependant, but as a rival of the dictator. After the death of Sylla, Pompey supported himself against the remains of the Marian faction, headed by Lepidus. He defeated them, put an end to the war of Sertorius in Spain, and obtained a second triumph, though still a private citizen, about 73 years before the Christian era. He was soon after made consul, and in that office he prosecuted the piratical war, and extirpated the maritime robbers who had almost destroyed the naval power of Rome in the Mediterranean. He was next appointed to the command of the Mithridatic war, in which, in a general engagement, the Romans so totally defeated the enemy, that Mithridates escaped with difficulty from the field of battle. Having conquered a vast tract of Asia, and, like a master of the world, disposed of kingdoms and provinces, Pompey at length returned to Italy with all the pomp of an eastern conqueror. The Romans dreaded his approach, but he banished their fears by disbanding his army. This modest behaviour gained him more real friends than the most unbounded power. For these signal services he was honoured with a triumph. To strengthen himself in his power, Pompey soon after united his interest with that of Cæsar and Crassus, who formed the first triumvirate. The agreement was completed by the marriage of Pompey with Julia the daughter of Cæsar, and the provinces of the republic were arbitrarily divided among the triumvirs. This confederacy, however, was soon broken by the sudden death of Julia, and the total defeat of Crassus in Syria. Pompey dreaded his father-in-law, and yet he affected to despise him; and by suffering anarchy to prevail in Rome, he convinced his fellow citizens of the necessity of

investing him with dictatorial power. But while the conqueror of Mithridates was a sovereign at Rome, the adherents of Cæsar were not silent. The breach henceforth widened between the two illustrious characters, and Cæsar at length passed the Rubicon, the boundary of his province, which act was, on his side, a declaration of war, and marched immediately to Rome. Pompey did not await his approach, but abandoned that city, and fled to Brundisium, with the consuls, and part of the senators. His cause was popular, and Cato, by embracing it, seemed to indicate, that he was the assertor of Roman independence. But Cæsar was now master of Rome, and in sixty days all Italy acknowledged his power. Having gained the western parts of the Roman empire to espouse his cause, Cæsar crossed Italy and arrived in Greece, where Pompey had retired, supported by all the power of the east, and the wishes of the republican Romans. At length the two hostile armies engaged in the plains of Pharsalia, in Thessaly. The whole was conducted against the advice and approbation of Pompey, and his usual good fortune deserted him. His cavalry soon gave way, and the general seeing a complete defeat ensue, retired to his camp, overwhelmed with grief, where he disguised himself, and fled to the sea coast, whence he passed to Egypt, to seek an asylum in the court of Ptolemy, who had the baseness to betray him. A boat was sent to fetch him on shore, and the Roman general having left his galley, after an affectionate parting with his wife Cornelia, was assassinated by Achilles and Septimius on the shore in the presence of Cornelia. He died B. C. 48, in the 58th or 59th year of his age. His head was cut off, and sent to Cæsar, who turned away from it with horror, and shed a flood of tears. Cæsar erected a monument on his remains. The character of Pompey is that of an intriguing and artful general, and the *oris proli* and *animo invêrecundo* of Sallust; is the most descriptive picture of his character. In his private character, however, he lived with great temperance and moderation. Pompey married four different times. His marriage with Julia, the daughter of Cæsar, was a step more of policy than affection. Yet Julia loved Pompey with great tenderness, and her death in child-bed was the signal of war between her husband and her father. He afterwards married Cornelia, the daughter of Metellus Scipio, a woman commended for her virtues, beauty, and accomplishments.—2. The two sons of Pompey the Great, called Cneius and Sextus, were masters of a powerful army, when the death of their father was known. They prepared to oppose the conqueror, but were defeated by Cæsar at the battle of Munda, and Cneius was left among the slain. Sextus fled to Sicily, where he for some time supported himself; but the murder of Cæsar giving rise to new events, he was at length defeated in a naval engagement by Octavius and Lepidus, and, of all his numerous fleet, consisting of 350, only 17 sail accompanied his flight to Asia.

Here for a moment he raised seditions, but Antony ordered him to be seized and put to death, about 35 years before the Christian era. Sextus vainly styled himself the son of Neptune and Lord of the Seas.

POMPHOLYX. (πομφολυξ, from πομφος, a bladder.) See **TUTIA**.

POMPIGNAN (John James le Franc, marquis of), a French writer, born at Montauban, 1709. He cultivated the muses, and his tragedy of Dido raised him to the rank of a poet, little inferior to Racine. He became member of the French academy 1760, and pronounced at his admission a discourse in favour of christianity, by proving that the man of religion and virtue is the only true philosopher, which drew upon him the ridicule of the profligate philosophers of the times; of Voltaire, Helvetius, and their associates. This drove him from Paris to his estate, where he spent the rest of his days employed in philosophy and religion, and died there of an apoplexy, 1784. His works consist of dramatic pieces—moral discourses—sacred odes—An imitation of the Georgics—voyage de Languedoc, &c.

POMPILIUS, a grammarian of Syria, who opened a school at Rome, and had Cicero and Cæsar among his pupils. See **NUMA**.

POMPILIA, a daughter of Numa Pompilius. She married Numa Martius, by whom she had Ancus Martius, the fourth king of Rome.

POMPONIA. The most remarkable of this name is the wife of Q. Cicero, sister to Pomponius Atticus. She punished with the greatest cruelty Philologus, the slave who had betrayed her husband to Antony, and she ordered him to cut his flesh by piece-meal, and afterwards to boil it and eat it in her presence.

POMPONIUS, a celebrated Roman, intimate with Cicero. He was surnamed Atticus, from his long residence at Athens. (See **ATTICUS**.) 2. A Roman who accused Manlius the dictator of cruelty. He triumphed over Sardinia, of which he was made governor. He escaped from Rome, and the tyranny of the triumvirs, by assuming the habit of a pretor, and by travelling with his servants disguised in the dress of lictors with their fasces. 3. Secundus, an officer in Germany in the age of Nero. He was honoured with a triumph for a victory over the barbarians of Germany. He wrote some poems greatly celebrated by the ancients for their beauty and elegance.—This name was common to many other illustrious Romans.

POMPONATIUS (Peter), an eminent Italian, born at Mantua, 1462. He taught philosophy at Padua and Bologna with the highest reputation. In his book *De Immortalitate Animæ*, he observes, that the immortality of the soul cannot be proved by philosophical reasons; he, however, thought it proper to add, that as an article of faith, he believed in it. This precaution did not save him, and he was persecuted as an atheist. He died in 1525.

POMPOUS. *a.* (pompeux, Fr.) Splendid; magnificent; grand (*Pope*).

POMPOUSLY. *ad.* (from *pompous*.) Magnificently; splendidly (*Dryden*).

POMPOUSNESS. *s.* (from *pompous*.) Magnificence; splendour; showiness; ostentatiousness (*Addison*).

POMUM ADAMI. (*pomum*, an apple; so called because it was thought to have originated in consequence of Adam having eaten the forbidden fruit.) The protuberance in the anterior part of the neck, formed by the fore part of the thyroid cartilage.

PONÆA, in botany, a genus of the class octandria, order tryginia. Calyx five-parted; corol four-petalled; capsule three-celled, three-winged; the cells one-seeded. One species, a Guiana tree, with abruptly pinnate leaves, and terminal racemes.

POND. *s.* (supposed to be the same with *pound*; *runðan*, Saxon, to be shut up.) A small pool or lake of water; a basin; water not running or emitting any stream (*Woodward*).

To **POND.** *v. a.* To ponder: obsolete.

POND (Fish). In making fish-ponds it is generally agreed that those grounds are best which are full of springs, and apt to be moorish, for while the springs will breed the stock well, the marshiness will preserve them from being stolen: and it has been observed, that ponds which receive the stale and dung of horses and other cattle breed the largest and fattest fishes.

Lebault, Dubravius, and others, however, advise us to make choice of such place for a pond as may be refreshed with a little rill, or with rain-water running or falling into it; by which fishes are more inclined both to breed, are refreshed and fed the better, and prove of a much sweeter and more pleasant taste.

Such pools, again, as are large and have most gravel, and shallows where they may sport themselves at liberty, afford fishes of the purest taste. And observe, that in all pools it is best to allow some retiring place; as hollow banks, or shelves, or roots of trees to keep the stock from danger; and, when they think fit, from the extreme heat of summer, or the extreme cold of winter. Yet if many trees be suffered to overhang your pond, the frequency and number of their leaves falling into the water will make the water nauseous to the fishes, and the taste of the fishes nauseous to the eater.

Tench and eel love mud; the carp loves a gravelly ground, and in the hot months to feed on grass. Cleanse your pond, if you intend either profit or pleasure, once every three or four years, and let it lie dry six or twelve months, as well to kill the water-weeds, as water lilies, candoeks, and bulrushes that breed there, as that grass may grow in the pond's bottom, which carp will eat greedily in all the hot months if the pond be clean. The letting your pond dry and sowing oats in the bottom is also a good plan, for the fishes feed the faster.

Lebault also advises, that if your ponds be not very large and roomy, you often feed your fishes by throwing into them chippings of bread, curds, grains, or the entrails of chickens or of any other fowl. He affirms that frogs and ducks do much harm, and devour both the spawn and the young fry of all fishes, especially of the carp.

Carp and tench thrive and breed best when no other fish is put with them into the same pond; for all other fishes devour their spawn, or at least the greatest part of it. When you store your pond, put into it two or three melters to one spawner, if it be a breeding-pond; but if a nurse-pond, or feeding-pond, in which they will not breed, then no care need to be taken, whether there be most male or female carp.

It is observed, that the best ponds to breed carps are those that are stony or sandy, and are warm, and free from wind, and that are not deep, but have willow trees and grass on their sides, over which the water does sometimes flow: and note, that carps do more usually breed in marle-pits, or pits that have clean clay bottoms, or in new ponds, or ponds that lie dry a winter season, than in old ponds, that be full of weeds.

The best way to make the pond head secure, is to drive in two or three rows of stakes about six feet long, at about four feet distance from each other, the whole length of the head, the first row of which is to be rammed, at least, four feet deep, that they may stand strong and sure. And if you happen to find the bottom false, especially if it consists of a running-sand, you may besides lay the foundation with quicklime, which upon slacking will make it as hard as a stone.

Then dig your pond, and cast the earth among the piles and stakes, and when they are well covered over, drive in another row or two over them, ramming in the earth in the void spaces, that it may lie close and keep in the water; and so you may continue stakes upon stakes, ramming in the earth till your pond head be of the height you designed it.

The inside of the dam must be very smooth and straight, that no current may have power over it.

If the pond carries six feet water, it is enough; but it must be eight feet deep, to receive the freshes and rains that should fall into it.

It would also be advantageous, as we have already observed, to have shoals on the sides, for the fishes to sun themselves on, and lay their spawn on; besides which you should allow them a few hollow banks, shelves, roots of trees, islands, &c. to serve as their retiring places. In a breeding pond never expect any large carp, for the greatness of the number of the spawn will overstock the pond, and a store-pond has always been accounted the best for large carp.

If you would make a breeding-pond become a store-pond, first determine what quantity of carp it will contain, and then put in either all melters, or all spawners, by which means in a

little time you may have carp that are both large and are exceeding fat; for by putting in but one sex you prevent the possibility of their increase; yet the roach will, notwithstanding, multiply abundantly.

In disposing of the principal waters, you must remember to reserve some for the head quarters of the fishes, from which you may take, or in which you may put, any ordinary quantity. You should also have stews, and other auxiliary waters, so that you may convey any part of the stock from one to the other, by which means you will never want, and need never abound; and will lose no time in the growth of the fish, but employ the water, as land is employed, to the best advantage.

The condition of the place must determine the quantity of the ground to be covered with water. For example: we may propose, perhaps, in all fifteen acres in three ponds; or eight acres in two, and less there should not be; and these ponds should be placed one above another, so that the point of the lower may almost reach the upper: which contrivance is no less beautiful than advantageous. The head, or bank, which by stopping the current is to raise the water, and so make a pond, must be built with clay and earth, taken out of the pan or hollow digged in the lowest ground above the bank; and this pan should be shaped as a half oval, the flat of which reaches the bank, and the longer diameter runs square from it.

TO PONDER. *v. a.* (*pondero*, Latin.) To weigh mentally; to consider; to attend (*Bacon*).

TO PONDER. *v. n.* To think; to muse; with *on*. Improper use (*Dryden*).

PONDERABLE. *a.* (from *pondero*, Lat.) Capable to be weighed; measurable by scales (*Brown*).

PONDERAL. *a.* (from *pondus*, Latin.) Estimated by weight; distinguished from numeral (*Arbuthnot*).

PONDERATION. *s.* (from *pondero*, Latin.) The act of weighing (*Arbuthnot*).

PONDERER. *s.* (from *ponder*.) He who ponds.

PONDEROSITY. *s.* (from *ponderous*.) Weight; gravity; heaviness (*Brown*).

PONDEROUS. *a.* (*ponderosus*, Latin.) 1. Heavy; weighty (*Bacon*). 2. Important; momentous (*Shaks*). 3. Forceful; strongly impulsive (*Dryden*).

PONDEROUS SPAR, in mineralogy. See **BARYTES**.

PONDEROUSLY. *ad.* (from *ponderous*.) With great weight.

PONDEROUSNESS. *s.* (from *ponderous*.) Heaviness; weight; gravity (*Boyle*).

PONDESTURIA, a town of Italy, in Monterrat, seated on the S. side of the Po, 33 miles E. of Turin. Lon. 8. 25 E. Lat. 45. 2 N.

PONDICHERRY, a town of Hindustan, on the coast of Coromandel, settled by the French in 1674. Previously to the war of 1756, it was, perhaps, the finest city in India.

It extended along the sea-coast above a mile, and was three quarters of a mile in breadth. It was well built, and, beside many public buildings, had a citadel, then the best of its kind in India. This city was taken by the English, in 1761, and immediately razed, in retaliation of M. Lally's conduct toward Fort St. David, in 1758. It was restored in 1763; taken by the English in 1778; restored in 1783; and again taken by the English in 1793. It is 100 miles S. of Madras. Lon. 80. 0 E. Lat. 11. 56 N.

PON'ENT. *a.* (*ponente*, Italian.) Western (Mong).

PONG-HOU, islands in the China Sea, which lie E. of the coast of Fokien, and form an archipelago between the part of Emouy and the island of Formosa. They are only sand banks or rocks; and not a shrub is to be seen upon them. The harbour in the principal island is good, and sheltered from every wind. A Chinese garrison is kept here, with one of the mandarins called literati, whose chief employment is to watch the trading vessels to and from China and Formosa. Lon. 121. 25 E. Lat. 23. 30 N.

PONGO, in mastiology. See **SIMIA**.

PONIARD. *s.* (*poignard*, Fr.) A dagger; a short stabbing weapon (*Dryden*).

To **PONIARD.** *v. a.* (*poignardier*, Fr.) To stab with a poniard.

PONK. *s.* A nocturnal spirit; a hag (*Spenser*).

PONS, a town of France, in the department of Lower Charente, famous in the time of the Huguenots. It has a mineral spring, and is seated on a hill, near the river Seigne, 10 miles S. of Saintes. Lon. 0. 30 W. Lat. 45. 36 N.

PONS (St.), a town of France, in the department of Herault. It was a bishop's see before the revolution, and is seated in a valley surrounded by mountains, in which are fine marble quarries. It is 24 miles N. of Narbonne. Lon. 2. 47 E. Lat. 43. 29 N.

PONS VAROLII. In anatomy. *Corpus annulare.* *Processus annularis.* Eminentia annularis. Varolius's bridge. An eminence of the medulla oblongata, first described by Varolius. It is formed by the two exterior crura of the cerebellum becoming flattened and passing over the crura of the cerebrum.

PONTÁ DELGADA, a seaport of St. Michael, one of the Azores. It is defended by a citadel; and contains about 8,000 inhabitants. Lon. 25. 40 W. Lat. 37. 45 N.

PONTAFELLA. See **PONTEFA**.

PONTAGE. *s.* (*ponts*, *pontis*, a bridge.) Duty paid for the reparation of bridges.

PONT-A-MOUSSON, a considerable town of France, in the department of Meurthe, with a university. There were lately several religious houses, and the premonstrantes had a magnificent church here. It is seated on the Moselle, which divides it into two parts, two miles N.W. of Nanci. Lon. 6. 16 E. Lat. 48. 43 N.

PONT-ARLIER, an ancient town of France,

in the department of Jura, seated on the river Doubs, near Mount Jura. It is a commodious passage into Swisserland, and is defended by a strong castle. Lon. 6. 26 E. Lat. 46. 55 N.

PONT-AUDEMER, a town of France, in the department of Eure, seated on the Rille, 13 miles E. of Honfleur, and 85 N.W. of Paris. Lon. 0. 35 E. Lat. 49. 21 N.

PONT-DE-CE, a town of France, in the department of Maine and Loire, seated on the Loire, three miles from Angers, and 178 S.W. of Paris. Lon. 0. 29 W. Lat. 47. 25 N.

PONT-DE-L'ARCHE, a town of France, in the department of Eure, with a castle. It is seated on the Seine, over which is a bridge, five miles N. of Louviers, and 62 N.W. of Paris. Lon. 1. 15 E. Lat. 49. 5 N.

PONT-DE-VAUX, a town of France, in the department of Ain, seated on the Ressousse, eight miles S. of Macon. Lon. 4. 55 E. Lat. 46. 28 N.

PONT-DE-VESLE, a town of France, in the department of Ain. It has a manufacture of stuffs called Augustines, and also of tapestry for the coverings of arm-chairs and sofas, of the same kind as those of Ambusson. It is seated on the Vesle, 12 miles W. of Bourg. Lon. 5. 4 E. Lat. 46. 16 N.

PONT-DU-GARD. See **GARD**.

PONTE-DE-LIMA, a town of Portugal, in Entre-Douero-e-Minho, with a palace. It is seated on the Lima, over which is a magnificent bridge, 13 miles N.W. of Braga, and 190 N. of Lisbon. Lon. 8. 44 W. Lat. 41. 51 N.

PONTE-STURA, a town of Italy, in Montferrat, seated at the confluence of the Stura and Po, three miles S.W. of Casal.

PONTERERIA, in botany, a genus of the class hexandria, order monogynia. Corol one-petal, six-cleft, two-lipped; stamens three, inserted three in the tip, and three in the tube of the corol; capsule three-celled. Six species; aquatics of the East or West Indies. See Nat. Hist. Pl. CXL.

PONTEFA, or **PONTAFELLA**, a town of Germany, in Carinthia, seated on the Fella, over which is a bridge that leads to the best passage over the Alps. It is 20 miles N.W. of Friuli. Lon. 13. 0 E. Lat. 46. 25 N.

PONTEFRAC, a borough in the W. riding of Yorkshire, with a market on Saturday. It is situate in a very rich soil, and noted for its large plantations of licorice. Its castle, now in ruins, has been the scene of various tragical events in the English history, particularly the murder of the unfortunate Richard II. It is governed by a mayor, sends two members to parliament, and is 22 miles S.W. of York, and 175 N.N.W. of London. Lon. 1. 18 W. Lat. 53. 42 N.

PONTELAND, a village in Northumberland, on the river Blythe, seven miles N. E. of Newcastle. It was a Roman station, called Pons Ælii; and here, in 1244, a peace was concluded between Henry III. and the king of Scotland.

P O N

PONTIANA, a river of Borneo, which enters the ocean by several mouths, at the west side of the island, under the equinoctial line, where the Dutch have a factory.

PONTICUM MARE, the sea of Pontus, generally called the Euxine.

PONTIFF. *s.* (*pontifex*, Latin.) 1. A priest; a high priest (*Bacon*). 2. The pope.

PONTIFICAL. *a.* (*pontificalis*, Latin.) 1. Belonging to a high priest. 2. Popish (*Baker*). 3. Splendid; magnificent (*Shakspeare*). 4. (from *pons* and *facio*.) Bridge-building.

PONTIFICAL. *s.* (*pontificale*, Latin.) A book containing rites and ceremonies ecclesiastical (*Stillingfleet*).

PONTIFICALLY. *ad.* (from *pontifical*.) In a pontifical manner.

PONTIFICATE. *s.* (*pontificatus*, Latin.) Papacy; popedom (*Addison*).

PONTIFICE. *s.* (*pons* and *facio*.) Bridge-work; edifice of a bridge (*Milton*).

PONTIFICIAN. *a.* (from *pontiff*.) Adhering to the pope; popish (*White*).

PONTIUS. The most celebrated of this name is—Herennus, a general of the Samnites, who surrounded the Roman army under the consuls T. Veturius and P. Posthumus. He made the Roman army pass under the yoke, but was afterwards conquered, and obliged in his turn to pass under it. Fabius Maximus defeated him, when he appeared again at the head of another army, and he was afterwards shamefully put to death by the Romans, after he had adorned the triumph of the conqueror.

PONTIVY, a town of France, in the department of Morbihan, with a linen manufacture; seated on the river Blavet, 25 miles N. of Vannes.

PONTLEVIS. *s.* A disorderly action of a horse in disobedience to his rider, in which he rears up several times running (*Bailey*).

PONTOISE, a town of France, in the department of Seine and Oise, with a castle. In 1435, the English took it by stratagem; and Charles VII. retook it by storm in 1442. The parliament of Paris was transferred to this place in 1652, 1720, and 1753. It is seated on an eminence, near the Oise, 27 miles N.W. of Paris. Lon. 2. 6 E. Lat. 49. 3 N.

PONTON, or **PONTOON**, in war, denotes a little floating bridge made of boats and planks. The ponton is a machine consisting of two vessels, at a little distance, joined by beams, with planks laid across for the passage of the cavalry, the cannon, infantry, &c. over a river, or an arm of the sea, &c. The late-invented ponton is of copper, furnished with an anchor, &c. to fix to it. To make a bridge, several of these are disposed two yards asunder, with beams across them; and over those are put boards or planks. They are also linked to each other, and fastened on each side the river by a rope run through a ring in each of their heads, and fixed to a tree or stake on either shore; the whole makes one firm uniform bridge, over which a train of artillery may pass.

P O O

PONTREMOLI, a town of Tuscany, with a strong castle; seated at the foot of the Apennines, on the river Magra, 55 miles N.N.W. of Pisa. Lon. 9. 40 E. Lat. 44. 25 N.

PONTUS, a kingdom of Asia Minor, bounded on the east by Colchis, west by the Halys, north by the Euxine sea, and south by Armenia. It was governed by kings, and was in its most flourishing state under Mithridates the Great: it at length became a Roman province, and under the emperors a regular governor was always appointed over it. 2. A part of Mysia in Europe on the borders of the Euxine sea, where Ovid was banished. 3. An ancient deity, father of Phorcys, Thanmas, Nereus, Eurybia and Ceto by Terra. He is the same as Oceanus. (*Apollod.*).

PONTUS EUXINUS. See **EUXINUS**.

PONTYPOOL, a town in Monmouthshire, with a market on Saturday, and a manufacture of japanned ware. It is seated between two hills, on the river Avon, 15 miles S.W. of Monmouth, and 149 W. by N. of London.

PONY. *s.* A small horse.

PONZA, a small island in the Mediterranean, near the coast of Naples, at the entrance of the gulf of Gaeta; containing a town, harbour, and considerable salt-works. Lon. 13. 10 E. Lat. 40. 53 N.

PONZONE, a town of Piedmont, in the duchy of Montferrat, 10 miles S. of Acqui, and 18 N. of Savona.

POOL. *s.* (*pul*, Saxon.) A lake of standing water (*Burnet*).

POOLE (Matthew), an English divine, born at York, in 1624, and educated at Oxford. He became rector of St. Michael le Quern, London, from whence he was ejected in 1662, for nonconformity. He wrote against popery, but his greatest works are his Annotations, and his Synopsis Criticorum, in 5 vols. folio, London, 1669. He died at Amsterdam in 1679.

POOLE, a borough and seaport in Dorsetshire, with a market on Monday and Thursday. It is a country of itself, governed by a mayor, and situate on a peninsula projecting into a capacious bay, which branches into many creeks, and forms several islands. The harbour admits vessels of moderate size only; but for them it is very secure. Poole rose into some consequence, when the ancient town of Wareham fell into decay. The principal branch of business here is the Newfoundland fishery. It has also a large importation of deals from Norway, a general commerce with America and various parts of Europe, and a fine coasting trade, particularly in corn and coal. Near the mouth of the harbour is an oyster bank, from which vast quantities are carried, to be fattened in the creeks of Essex and the Thames. Poole is 40 miles W.S.W. of Winchester, and 105 W. by S. of London, Lon. 1. 59 W. Lat. 50. 43 N.

POOLORON, or **POLERON**, one of the Banda islands, 100 miles S.E. of Amboyna. Lon. 130. 0 E. Lat. 4. 20 S.

POOLOWOY, one of the Banda islands,

on which the Dutch have a regular pentagon, called Fort Revenge.

POONA, a town of Hindustan, in Visapour, and the capital of the Western Mahratta empire. It is not large, and entirely defenceless; the chief seat of power being at Poorunder. It is 100 miles S.E. of Bombay. Lon. 73. 55 E. Lat. 18. 30 N.

POOP, the stern of a ship, or the highest, uppermost, and hinder part of the ship's hull.

POOR, *a.* (*pauvre*, French; *povre*, Spanish.)

1. Not rich; indigent; necessitous; oppressed with want (*Pope*). 2. Trifling; narrow; of little dignity, force, or value (*Bacon*). 3. Paltry; mean; contemptible (*Davies*). 4. Unimportant (*Swift*). 5. Unhappy; uneasy; pitiable (*Waller*). 6. Mean; depressed; low; dejected (*Bacon*). 7. (A word of tenderness.) Dear (*Prior*). 8. (A word of slight contempt.) Wretched (*Baker*). 9. Not good; not fit for any purpose (*Shakespeare*). 10. *The Poor*. Those who are in the lowest rank of the community; those who cannot subsist but by the charity of others (*Sprat*). 11. Barren; dry; as, a poor soil. 12. Lean; starved; emaciated (*Ben Jonson*). 13. Without spirit; flaccid.

POOR LAWS. Of the general outline of this most enormous and almost ineffectual burden on the people, much has been said in the excellent treatise of Mr. Colquhoun. The 43 of Elizabeth, c. 2, is the foundation of all that is good in the poor laws; making provision for finding work for the industrious and able; for compelling the idle and able to labour; and for affording relief to the diseased and impotent: and the 13, 14 Charles II. c. 12, is the foundation of all that is evil, by forming the system of settlements and removals; a system, establishing oppression, litigation, and expense, and which has been made more oppressive, and more productive of litigation and expense by every subsequent statute, till the statute of the 35th of his present majesty; which, by forbidding removals in case the pauper is not absolutely chargeable, has remedied more than half the evils occasioned by the former laws.

Overseers.—The churchwardens of every parish, with two, three, or four substantial householders, according to the size of the parish, to be nominated in Easter week, or within a month after, under the hands and seals of two or more neighbouring justices, and who shall be called overseers of the poor. 43 Elizabeth, c. 2, s. 1.

Where there are no churchwardens, the whole power is vested in the overseers, 17 George II. c. 38, s. 15.

Overseer dying, or becoming incapable of acting, two justices may appoint another. *Ibid.* s. 3. If any person shall find himself aggrieved by any act of the justices, Ap.* sessions, whose determination shall be final. *Ibid.* s. 6.

Where there is no nomination of overseers, P. 51. on every justice of the division. R. by distress from the sessions, to be levied by the churchwardens and overseers. 43 Elizabeth, c. 2, s. 10.

* In this article the following abbreviations will be used: P. denotes penalty; R. the mode of recovering it; A. the application; Ap. the appeal; J. 1 or 2, and W. 1 or 2, justices or witnesses.

Parish officers, with consent of two justices, shall set children to work, whose parents cannot maintain them, and all persons, married or single, who cannot maintain themselves, and have no regular trade or calling; and one justice may send persons to the house of correction who will not work; and the parish officers, not having an excuse, to be allowed by two justices, shall meet once in a month, at least, in the church on a Sunday after evening service, to consult. P. 20s. R. distress, and, in default, commitment till paid. J. 2. A. the poor. Ap. sessions. *Ibid.* s. 1, 2, 6, 11.

Overseers, within four days after the end of their year, shall account to two justices of all sums received and paid, and pay over what remains to their successors; who, in default, may levy it by distress, under warrant of two justices; who, in default of distress, may commit till paid. *Ibid.* s. 2, 4.

Every parish officer neglecting to obey the regulations of the above act, P. 40s. to 51. R. distress. J. 2. A. the poor. 17 George II. c. 38, s. 14.

Parish officer neglecting his duty, or disobeying the warrant of a justice, P. 40s. R. distress, and, in default, commitment not exceeding ten days. J. 2. A. the poor. Ap. sessions, giving ten days notice. 33 George III. c. 55, s. 1, 2.

Rate.—Parish officers shall raise by a rate on all the inhabitants, a stock of flax, &c. to set the poor to work, and sums for the relief of the old and lame who are not able to work, and for apprenticing poor children. Rate to be made by consent of two justices. 43 Elizabeth, c. 2, s. 1.

Parish officers shall cause notice to be given publicly in the church, of such consent of the justices, the next Sunday; and no rate shall be collected till such notice is given. 17 George II. c. 3, s. 1. They shall permit the inhabitants to inspect such rates at all reasonable hours, on payment of 1s.; and give copies on payment of 6d. for every twenty-four names. P. 20s. A. to the party aggrieved. *Ibid.* s. 2, 3.

Persons aggrieved by assessment, Ap. sessions, 17 George II. c. 38, s. 4.

Goods of persons refusing to pay, may be distrained in any part of the county; and of any other county, on oath made before a justice of such other county, which oath shall be certified in the warrant. Ap. to the sessions of the county where the assessment was made. *Ibid.* s. 7.

If two justices perceive that the inhabitants of any parish are not able to levy money sufficient for the relief of the poor, they shall assess any neighbouring parish within the hundred, in aid; and if the hundred shall not be of sufficient ability, then any parishes within the county. 43 Elizabeth, c. 2, s. 3.

Father, grandfather, mother, or grandmother, of persons wanting relief, shall maintain them; P. 20s. per month. R. distress, and, in default, commitment till paid. J. 2. A. the poor. *Ibid.* s. 2, 11.

Fathers leaving their wives and children, and mothers their children, chargeable to the parish, having ability to maintain them, the parish officers, where such are left, may, by warrant of two justices, seize so much of the goods and chattels, or receive so much of the annual rent as such justices shall appoint, to reimburse the parish; and such order to be confirmed by the sessions, 5 George I. c. 8, s. 1.

P O O R L A W S.

Parish officers, with consent of the lord of the manor, may, by order of two justices, erect cottages on waste lands, for the poor. 43 Elizabeth, c. 2. s. 5.

They may also, with consent of two justices, set up trades, &c. for the employment of the poor. 3 Charles II. c. 4, s. 22.

Relief.—Parish officers, with consent of the majority of the inhabitants, may contract with any person for the lodging, keeping, maintaining, and employing the poor; and persons refusing such relief are not entitled to any other. 9 George I. c. 7, s. 4.

The abominable oppression of this execrable law has, however, been removed by another humane statute of the present reign; for by 36 George III. c. 25, s. 1, 2, 3, it is enacted, that it shall be lawful for the parish officers, with the approbation of one justice in writing, to relieve any industrious person at his own habitation, under certain circumstances of temporary illness or distress; and one justice may order such relief for any time not exceeding one month, provided the cause be written on the back of the order, which the parish officers are bound to obey; and two justices may continue such order from time to time, each period in succession not being more than one month.

A justice, or a medical man, or clergyman, by warrant of a justice, may visit workhouses, and examine the state of them, and hear complaints, and certify to the sessions; and if there should be any infectious disorder, the visiting justice shall apply to another justice, or any other person visiting, to two justices; which two justices shall order such regulations as they deem necessary, till the next sessions. 30 George III. c. 49, s. 1, 2.

Names of persons receiving parish relief to be entered in a book. 3 William, c. 11, s. 11. And no other person to be relieved but by order of a justice. *Ibid.*

No relief to be ordered by a justice unless for a reasonable cause, proved on oath, and unless the pauper shall have first applied to a parish officer or a vestry, nor before the justice shall have summoned the parish officers. 9 George I. c. 7, s. 1.

The name of such person to be entered with the others; and no parish officer, except on sudden emergency, shall bring any charge on the parish for persons not so registered. P. 51. R. distress. J. 2. A. poor. *Ibid.* s. 2.

Persons receiving relief to be badged on the shoulder with a large Roman P, and the initial of the name of the parish. P. forfeiture of the relief, or commitment for not above twenty-one days. J. 1. And on every peace officer who shall relieve any person not so badged, 20s. R. distress. J. 1. A half to the informer, half to the poor. 8, 9 William, c. 3, s. 2.

Settlements.—The general heads on which settlements are founded are, birth, apprenticeship, service, serving offices, renting 10l. per annum, marriage, and estate.

1. **Birth.**—Children, *primâ facie*, whether bastard or legitimate, are settled where born: but with respect to bastards, if a woman goes collusively to be delivered in another parish, the child gains no settlement there.

Bastards born during an order of removal, or the suspension of it, belong to the mother's parish. 35 George III. c. 101, s. 6. And so of bastards born in vagrancy. 17 George II. c. 5, s. 25. And so if born in houses of industry in incorporated districts. 20 George III. c. 36. Or in friendly

societies. 33 George III. c. 54, s. 25. Or in lying-in hospitals. 13 George III. c. 82.

Legitimate children are settled as their parents, till old enough to gain a settlement of their own; the earliest period of which is seven years: at which age, by 5 Elizabeth, c. 5, s. 12, a child may be apprenticed to a person using the seas; and by 17 George II. c. 5, justices may bind the child of a vagrant of the same age; and any apprentice gains a settlement in a place where he has resided as such for forty days.

2. **Apprenticeship.**—The time required to gain a settlement has just been mentioned. The apprentice must be legally bound, except that the contract not being indented, which is fatal to the legality in every other case, is not in this. 31 George II. c. 11.

3. **Service.**—Unmarried person without children hired and serving for a year, gains a settlement, 3 William c. 11. But must continue a whole year in such service. 8, 9 William, c. 30. Serving a certificated member of a benefit society no settlement. 33 George III. c. 54, s. 24. Forty days residence in the place necessary, but they need not be all together. Where the last forty days are in different places, settlement where the servant slept the last night. General hiring deemed hiring for a year. Hiring for a year, with liberty to be absent at harvest, sheep-shearing, &c. gains no settlement; but to serve a month in the militia does. Hiring for one day short of a year no settlement. Serving for three hundred and sixty-five days, if leap-year, no settlement. Hiring at so much per week, conditionally to part at a month's warning, deemed a general hiring; and, as such, a hiring for a year.

4. **Serving Offices.**—Persons coming to inhabit a place, and executing any annual and public office for a year, settlement. 3 William, c. 11, s. 6.

5. **Renting 10l. per annum.**—This gains a settlement, if resided on forty days. 13, 14 Charles II.

6. **Marriage.**—As a general rule, the wife follows the husband's settlement; but if the husband has no settlement, or it is not known at his death, her own settlement is restored. And if the husband deserts his wife, her settlement remains.

7. **Estate.**—No person shall be removed from any estate while he remains on it. 9 George I. c. 7. But no person gains a settlement by any estate whose purchase was less than 30l. *Ibid.*

Persons who have no settlement, as foreigners, or whose settlement cannot be known, as deserted infants, must be kept by the parish where they happen to be.

Certificates.—This head is almost done away by the salutary law which will be noticed under.

Removals.—So much of 13, 14 Charles II. c. 12, as enables justices to remove persons likely to become chargeable, is repealed; and no person can now be removed till actually chargeable. 35 George III. c. 101, s. 1.

Justices may suspend removal of persons ill; either under a vagrant pass, or order of removal; expense attending the suspension to be paid by the parish officers of the place to which the pauper is to be removed; on refusal to pay within three days, R. distress and sale, with costs, not exceeding 40s. J. 1. If out of the jurisdiction, warrant of distress to be backed by a justice having jurisdiction. Ap. to the sessions, if charges and costs exceed 20l. *Ibid.* s. 2.

Every person convicted of larceny or felony, or deemed a rogue and vagabond, or disorderly per-

POOR'S RATE.

son, or who shall appear to two justices, on oath of one witness, to be a person of evil fame or a reputed thief, and shall not give a satisfactory account of himself and way of living; and every unmarried woman with child, shall be deemed actually chargeable, and be removed as such. *Ibid.* s. 6.

Persons refusing to go with an order of removal, or returning when removed, P. commitment as a vagabond. J. 1. 13, 14 Charles II. c. 12, s. 3.

Parish officer refusing to receive a person so sent, P. bound to the assizes or sessions, to answer the contempt. J. 1. *Ibid.*

If removed into another county or jurisdiction, and the parish officers refuse to receive, P. 5l. A. to the poor of the place from which the pauper is removed. R. distress, and, in default, commitment for forty days. J. 1. of the jurisdiction to which removed. W. 2. 3 William, c. 11, s. 10.

Appeal from orders of removal to the sessions of the county from which the pauper was removed. 8, 9 William, c. 30, s. 6. It must be to the sessions of the county, and not of any corporate town.—(*Brit. Ency.*)

POOR'S RATE, an assessment raised throughout England and Wales, for the temporary relief, or permanent maintenance, of all such persons, as from age, infirmity, or poverty, cannot themselves procure the means of subsistence. The first statute, or law made in England, which gives any particular directions concerning paupers, was 11 Henry VII. c. 2. it directs, "That every beggar, not able to work, shall resort to the hundred where he last dwelt, is best known, or was born; and shall there remain, upon pain of being set in the stocks, three days and three nights, with only bread and water, and then shall be put out of town." The insufficiency of this regulation soon became evident, and in 1531 an act was passed whereby the justices of every county were empowered to grant licences to poor, aged, and impotent persons, to beg within a certain precinct; but if they were found begging without licence, or beyond the limits specified, they were either to be whipped or set in the stocks. This however was a very inadequate mode of providing for the poor; and in 1536 an act was passed directing the governors and magistrates of counties, towns, and parishes, to provide for every aged, poor, and impotent person, who should have dwelt three years in any place, by means of the voluntary alms of charitable persons, which were to be collected for this purpose, in every parish. The act likewise directed, that sturdy vagabonds should be compelled to work, and that children from five to fourteen years of age, who lived in idleness, and were found begging, should be put to service.

Upon the destruction of the monasteries, from the charities of which the poor had derived their principal support, some further ineffectual attempts were made for their relief, by means of voluntary donations; but it was at length found necessary to stimulate public charity by a compulsory clause, in an act passed in 1563. This act directed, that if any parishioner shall obstinately refuse to pay reasonably towards the relief of the poor, or should discourage others, the justices of the peace, at their quarter-sessions, might tax him to a reasonable weekly sum, which if he refused to pay, they might commit him to prison. This may be considered as the origin of the poor's rate, which was rendered more general by an act passed in 1572, which directed that assessments should be made of the parishioners of every parish,

for the relief of the poor of the same parish; which was the first regular and effectual parochial assessment for the poor in England. In 1601, further regulations were adopted on this subject; it being enacted by 43 Elizabeth, c. 2. that every parish should be bound to provide for its own poor; and that overseers of the poor should be annually appointed, who, with the church-wardens, should raise, by a parish rate, competent sums for this purpose: the mode in which the assessment was directed to be made was, that the justices of the peace of every county or place corporate, or the major part of them, at the general sessions to be held after Easter following, and so yearly, as often as they should think fit, should rate every parish to such a weekly sum of money as they should think convenient; which sum, so taxed, was to be yearly assessed by an agreement of the parishioners within themselves, or in default thereof, by the churchwardens and petty constables, or by an order of the justices of the peace: and if any person refused or neglected to pay the portion of money so taxed, it might be levied by distress, and in default thereof, the person to be committed to prison till the money was paid. In this mode, or with very little variation, the poor's-rate has continued to be annually levied; but, as from the increase of population, the advanced price of all the necessaries of life, and other causes, the number of the poor has been greatly augmented, the sum raised for their support has progressively advanced to a very important magnitude.

According to an estimate, published by Dr. Davenant, of the sum raised by the poor's-rate in England and Wales, in the latter part of the reign of Charles II. it amounted to 665,362l. As the number of the poor increased, it not only became necessary to raise a greater sum for their maintenance, but new cases arose with respect to the claims of individuals to this kind of relief, in consequence of which various acts were passed for explaining and amending the laws for the relief of the poor. In 1735, the house of commons appointed a committee to consider of the existing laws relative to the maintenance and settlement of the poor, and what further provisions might be necessary for their better relief and employment. The committee came to several resolutions, which were agreed to by the house; the most important were, "that the laws in being, relating to the maintenance of the poor of this kingdom, are defective; and, notwithstanding they impose heavy burdens on parishes, yet the poor, in most of them, are ill taken care of;" and that it was very expedient, that the laws relating to the poor should be reduced into one act of parliament.

In 1776, a return was ordered to be made to parliament of the total expenditure on account of the poor, for one year, ending at Easter; pursuant to which, accounts were received from 14,113 parishes or places in England and Wales, from which it appeared, that the aggregate sum expended was 1,530,804l. 6s. 3d. and that there were then 1970 workhouses, capable of accommodating 89,775 persons. In 1786, a return was again ordered to be made of the average annual expenditure of the three preceding years, when accounts were obtained from 14,240 parishes or places, and the total was found to have increased in the short period of ten years to 2,004,238l. 5s. 11d. since which time a still greater increase has taken place.

In the year 1803, an act was passed for procuring returns relative to the expense and maintenance of the poor; from the answers and returns

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made pursuant thereto, the following particulars are derived.

Out of 14,611 parishes and places from which accounts were received, 3765 parishes maintain all, or part of, their poor in workhouses. The number of persons so maintained during the year, ending Easter 1803, was 85,468; and the expense, incurred therein, amounted to 1,016,445l. 15s. 3d. being at the rate of 12l. 3s. 6½d. for each person maintained in that manner.

The number of persons relieved out of workhouses was 956,248, besides 194,052, who were not parishioners. The expense, incurred in the relief of the poor not in workhouses, amounted to 3,061,446l. 16s./10½d. A large proportion of those, who were not parishioners, appear to have been vagrants, and it is probable that the relief given to this class of poor could not exceed two shillings each, amounting to 19,405l. 4s. This sum being deducted from the above 3,061,446l. 16s. 10½d. leaves 3,042,041l. 12s. 10½d. being at the rate of 3l. 3s. 7½d. for each parishioner relieved out of any workhouse.

The number of persons relieved in and out of workhouses was 1,039,716, and as the resident population of England and Wales, in the year 1801, appeared from the returns made under the population act to have been 8,872,980, the number of parishioners relieved from the poor's-rate appears to be twelve in a hundred of the resident population.

The expenditure, in suits of law, removal of paupers, and expenses of overseers and other officers, amounted to 190,072l. 17s. ½d. and the sum expended in purchasing materials for employing the poor to 47,523l. 11s. 4½d.

The poor of 293 parishes are stated in the returns to be farmed, or maintained under contract; and the poor of 764 parishes are maintained and employed under the regulations of special acts of parliament.

The total sum, raised by the poor's-rate, and other parochial rates within the year, ending Easter 1803, was 5,348,205l. 9s. 3¾d. The average rate in the pound was, in England 4s. 4½d. and in Wales 7s. 1½d. the average of England and Wales 4s. 5¼d. (*British Ency.*)

POORLY. *ad.* (from *poor*.) 1. Without wealth (*Sidney*). 2. Not prosperously; with little success (*Bacon*). 3. Meanly; without spirit (*Shakspeare*). 4. Without dignity (*Wotton*).

POORNESS. *s.* (from *poor*.) 1. Poverty; indigence; want (*Burnet*). 2. Meanness; lowness; want of dignity (*Addison*). 3. Sterility; barrenness (*Bacon*).

POORSPIRITED. *a.* (*poor* and *spirit*.) Mean; cowardly (*Dennis*).

POORSPIRITEDNESS. *s.* Meanness; cowardice (*South*).

POORUNDER, a fortress of Hindustan, in Visiapour, seated on a mountain, 18 miles E.S.E. of Pooná. It is the place of refuge for that capital in case of an invasion; and here the archives of government are kept.

POP. *s.* (*poppysma*, Lat.) A small smart quick sound. Formed from the sound (*Addison*).

To POP. *v. n.* (from the noun.) To move or enter with a quick, sudden, and unexpected motion (*Swift*).

POP

To POP. *v. a.* 1. To put out or in suddenly, silyly, or unexpectedly (*Shakspeare*). 2. To shift (*Locke*).

POPA MADRE, a town of Terra Firma, with a convent and chapel of the Virgin, to which the Spaniards in those parts go in pilgrimage, especially those who have been at sea. It is seated on a high mountain, 50 miles E. of Carthagená. Lon. 74. 32 W. Lat. 10. 15 N.

POPAYAN, a province of New Granada, in the W. part of that kingdom. A chain of barren mountains runs through the country from N. to S.; and the soil near the sea is flat, marshy, and often flooded by the rains.

POPAYAN, the capital of a province of that name in New Granada, and a bishop's see, with a university. The trade is considerable, and the inhabitants are estimated at 25,000. It stands in a large plain, 230 miles W.S.W. of St. Fe de Bogota, and 240 N.E. of Quito. Lon. 75. 55 W. Lat. 2. 35 N.

POPE, PAPA, FATHER, the sovereign pontiff, or supreme head of the Romish church. The appellation of pope was anciently given to all Christian bishops; but about the latter end of the eleventh century, in the pontificate of Gregory VII. it was usurped by the bishop of Rome, whose peculiar title it has ever since continued. The spiritual monarchy of Rome sprung up soon after the declension of the Roman empire. This sovereign is addressed under the term holiness, and in the council of the Lateran held under Innocent III. he was declared ordinary of ordinaries. The pope was an absolute monarch in his Italian dominions, and his power was very considerable; being able, in case of necessity, to put fifty thousand men into the field, besides his naval strength in galleys. The French revolution, which has reversed all order, and overthrown every government where its power extended, and substituted a barbarous and military tyranny in its place, has greatly impaired the splendour, dignity, and power of the pope; nor shall we be at all surprised to see the papal throne entirely reversed, and the territories added to some of the subordinate kingdoms lately erected by the usurper of France.

POPE (Alexander), an illustrious English poet, born 8th June, 1688, in the Strand, where his father was a hatter. He learned writing by imitating printed books, and at eight was placed under a priest named Taverner, under whom he learned Latin and Greek. At 12 he went to live with his parents at Binfield, in Windsor Forest, and first discovered his taste for poetry by reading Ogilby's Virgil and Sandys' Ovid; but the writings of Spenser, Waller, and Dryden, now became his favourite employment. He early tried his strength in poetry, and it is said that at the age of 10 he converted some of the stories of Homer into a play, which his schoolfellows acted with the assistance of his master's gardener, who undertook Ajax. His first regular composition was his Ode on Solitude; but his Pastorals, begun in 1704, introduced him soon as a promising

bard to the wits of the age, especially Wycherley and Walsh. In 1704, he wrote his first part of *Windsor Forest*, completed six years after, and inscribed to lord Lansdown. The *Essay on Criticism* appeared in 1708, and in this incomparable performance, though not yet 20 years old, he evinced all the genius and judgment of the most mature reflection. The fame of the essay was soon surpassed by the *Rape of the Lock*, in 1712. The poet chose for his subject the conduct of lord Petre in cutting off a lock of Mrs. Fermor's hair; and he had the happiness, by the delicate effusions of his muse, to effect a reconciliation between the offended parties. The *Temple of Fame* next appeared, and in 1713 he published proposals for a translation of Homer's *Iliad*. This was generously supported, and the poet received from subscribers 6000*l.* besides 1200*l.* from the bookseller Lintot for the copy. Thus raised to independence, Pope purchased a house at Twickenham, where he removed his father and mother, 1715. In 1717 he published a collection of his poems; but in his edition of Shakspeare, in 1721, he consulted his private emolument more than his fame. He attempted the *Odyssey* with Broome and Fenton, whose labours he rewarded with 500*l.* and he received the same subscription as before, but only 600*l.* from the bookseller. In 1725 he joined Swift and Arbuthnot in writing some miscellanies, and in 1727 he published his *Dunciad*, with notes by Swift, under the name of Scriblerus. This singular poem owed its origin to the illiberal remarks to which the poet had been exposed from the scriblers of the day. As a composition, the *Dunciad* is a work of great merit; and Cibber himself, the hero of the piece, declares that nothing was ever more perfect and finished in its kind. The principles, however, of the poet must be condemned: if it was justice to retort abuse on those who had offended him, it was the most profligate conduct to hang up to immortal ignominy men of genius, talents, and respectability, who instead of censuring him had been loud in his praise. Lord Bolingbroke in 1729 entreated him to turn his thoughts to moral subjects, and this produced his *Essay on Man*, a work of acknowledged merit, containing a system of ethics. In his ethic epistles, it is supposed that he reflected, in the character of Timon, on the duke of Chandos; and this propensity was unfortunately indulged in his satires, which he continued till 1739, and in which he censures, in the severest language, persons of the highest rank. In 1742, the poet gave to the world a fourth book of his *Dunciad*, and prepared a more perfect edition of his works; but death stopped his hand. His constitutional attack of the head-ach increased by a dropsy in the breast, baffled all relief, and he expired 30th May 1744, aged 56. He made, by his will, Miss Blount heiress to his property during her life, and he bequeathed all his works to his friend Warburton, who accordingly, in 1751, published a complete edition of the whole, in 9 vols. 8vo. A very

interesting essay on his writings and genius appeared in 1756, and in 1782 by Dr. Warton, and it was again reprinted with a new edition of his works in 1797. Though a catholic in religion, Pope was little more than a deist, as his *Essay on Man* fully justifies; yet in the latter part of his life he attended the English church. In his person he was little and somewhat crooked: he was capricious in his friendships; and though he was courted by men of rank and fashion, by lords Harcourt, Bolingbroke, and others, distinguished for opulence, as well as celebrity and wit, yet he never forgot the homage which should be paid to the man of poetical eminence. His manners, as lord Orrery has observed, were delicate, easy, and engaging; he treated his friends with a politeness that charmed, and a generosity that was much to his honour. Every guest was made happy within his doors; pleasure dwelt under his roof, and elegance presided at his table.

Dr. Johnson gives a view of the intellectual character of Pope, and draws a most exquisite parallel between Dryden and him. For particulars, however, we must refer our readers to Johnson's *Lives of the Poets*, vol. 4. *Life of Pope*.

POPE, or POPE JOAN, a game on playing cards somewhat similar to that of matrimony. It is played by a number of people, who generally use a board painted for this purpose, which may be purchased at most turners or toy shops.

The eight of diamonds must first be taken from the pack, and after settling the deal, shuffling, &c. the dealer dresses the board by putting fish, counters or other stakes one each to ace, king, queen, knave, and game; two to matrimony, two to intrigue, and six to the nine of diamonds, stiled pope. This dressing is in some companies at the individual expence of the dealer, though in others the players contribute two stakes a piece towards the same. The cards are next to be dealt round equally to every player, one turned up for trump, and about six or eight left in the stock to form stops: as for example, if the ten of spades is turned up, the nine consequently becomes a stop; the four kings and the seven of diamonds are always fixed stops, and the dealer is the only person permitted in the course of the game to refer occasionally to the stock for information what other cards are stops in that respective deal. If either ace, king, queen, or knave, happen to be the turned-up trump, the dealer takes whatever is deposited on that head; but when pope is turned up, the dealer is entitled both to that and the game, besides a stake for every card dealt to each player. Unless the game is determined by pope being turned up, the eldest hand begins by playing out as many cards as possible; first the stops, then pope if he have it, and afterwards the lowest card of his longest suit, particularly an ace, for that never can be led through; the other players are to follow when they can, in sequence of the same suit, till a stop occurs, and the party having the said stop, thereby becomes eldest

hand, and is to lead accordingly, and so on, until some person parts with all his cards, by which he wins the pool (game), and becomes entitled besides to a stake for every card not played by the others, except from any one holding pope, which excuses him from paying; but if pope has been played, then the party having held it is not excused. King and queen form what is denominated matrimony, queen and knave make intrigue, when in the same hand; but neither they, nor ace, king, queen, knave, or pope, entitle the holder to the stakes deposited thereon, unless played out, and no claim can be allowed after the board is dressed for the succeeding deal; but in all such cases the stakes are to remain for future determination.

This game only requires a little attention to recollect what stops have been made in the course of the same; as for instance, if a player begin by laying down the eight of clubs, then the seven in another hand forms a stop, whenever that suit is led from any lower card, or the holder when eldest may safely lay it down in order to clear his hand.

PO'PEDOM. *s.* (pope and dom.) Papacy; papal dignity (*Shakspeare*).

PO'PERY. *s.* (from *pope*.) The religion of the church of Rome (*Swift*).

The following summary, extracted chiefly from the decrees of the council of Trent, continued under Paul III. Julius III. and Pius IV. from the year 1545 to 1563, by successive sessions, and the creed of pope Pius IV. subjoined to it, and bearing date November 1564, may not be unacceptable to the reader. One of the fundamental tenets, strenuously maintained by popish writers, is the infallibility of the church of Rome; though they are not agreed whether this privilege belongs to the pope or a general council, or to both united; but they pretend that an infallible living judge is absolutely necessary to determine controversies, and to secure peace in the Christian church. However, Protestants allege, that the claim of infallibility in any church is not justified by the authority of scripture; much less does it pertain to the church of Rome; and that it is inconsistent with the nature of religion, and the personal obligations of its professors; and that it has proved ineffectual to the end for which it is supposed to be granted, since popes and councils have disagreed in matters of importance, and they have been incapable, with the advantage of this pretended infallibility, of maintaining union and peace.

Another essential article of the popish creed is the supremacy of the pope, or his sovereign power over the universal church. Further, the doctrine of the seven sacraments is a peculiar and distinguishing doctrine of the church of Rome: these are baptism, confirmation, the eucharist, penance, extreme unction, orders, and matrimony.

The council of Trent (sess. 7. can. 1.) pronounces an anathema on those who say, that the sacraments are more or fewer than seven, or that any one of the above number is not truly

and properly a sacrament. And yet it does not appear that they amounted to this number before the 12th century, when Hugo de St. Victore and Peter Lombard, about the year 1144, taught that there were seven sacraments. The council of Florence, held in 1438, was the first council that determined this number. These sacraments confer grace, according to the decree of the council of Trent (sess. 7. can. 8.) *ex opere operato*, by the mere administration of them: three of them, viz. baptism, confirmation, and orders, are said (can. 9.) to impress an indelible character, so that they cannot be repeated without sacrilege; and the efficacy of every sacrament depends on the intention of the priest by whom it is administered. (can. 11.) Pope Pius expressly enjoins, that all these sacraments should be administered according to the received and approved rites of the Catholic church. With regard to the eucharist in particular, we may here observe, that the church of Rome holds the doctrine of transubstantiation; the necessity of paying divine worship to Christ under the form of the consecrated bread, or host; the propitiatory sacrifice of the mass, according to their ideas of which Christ is truly and properly offered as a sacrifice as often as the priest says mass; it practises likewise solitary mass, in which the priest alone, who consecrates, communicates, and allows communion only in one kind, viz. the bread, to the laity. Sess. 14.

The doctrine of merits is another distinguishing tenet of popery; with regard to which the council of Trent has expressly decreed (sess. 6. can. 32.) that the good works of justified persons are truly meritorious; deserving not only an increase of grace, but eternal life, and an increase of glory; and it has anathematized all who deny this doctrine. Of this same kind is the doctrine of satisfactions; which supposes that penitents may truly satisfy, by the afflictions they endure under the dispensations of providence, or by voluntary penances to which they submit, for the temporal penalties of sin, to which they are subject, even after the remission of their eternal punishment. Sess. 6. can. 30. and sess. 14. can. 8. and 9. In this connection we may mention the popish distinction of venial and mortal sins; the greatest evils arising from the former are the temporary pains of purgatory; but no man, it is said, can obtain the pardon of the latter without confessing to a priest, and performing the penances which he imposes.

The council of Trent (sess. 14. can. 1.) has expressly decreed, that every one is accused who shall affirm that penance is not truly and properly a sacrament, instituted by Christ in the universal church, for reconciling those Christians to the divine majesty who have fallen into sin after baptism: and this sacrament, it is declared, consists of two parts, the matter and the form; the matter is the act of the penitent, including contrition, confession, and satisfaction; the form of it is the act of absolution on the part of the priest. Accordingly it is enjoined, that it is the duty of every

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man, who hath fallen after baptism, to confess his sins once a year, at least, to a priest: that this confession is to be secret; for public confession is neither commanded nor expedient: and that it must be exact and particular, including every kind and act of sin, with all the circumstances attending it. When the penitent has so done, the priest pronounces an absolution; which is not conditional or declarative only, but absolute and judicial. This secret, or auricular confession, was first decreed and established in the fourth council of Lateran, under Innocent III. in 1215. (cap. 21.) And the decree of this council was afterwards confirmed and enlarged in the council of Florence, and in that of Trent; which ordains, that confession was instituted by Christ, that by the law of God it is necessary to salvation, and that it has been always practised in the Christian church. As for the penances imposed on the penitent by way of satisfaction, they have been commonly the repetition of certain forms of devotion, as pater-nosters, or avemarias, the payment of stipulated sums, pilgrimages, fasts, or various species of corporal discipline. But the most formidable penance, in the estimation of many who have belonged to the Romish communion, has been the temporary pains of purgatory. But under all the penalties which are inflicted or threatened in the Romish church, it has provided relief by its indulgences, and by its prayers or masses for the dead, performed professedly for relieving and rescuing the souls that are detained in purgatory.

Another article that has been long authoritatively enjoined and observed in the church of Rome, is the celibacy of her clergy. This was first enjoined at Rome by Gregory VII. about the year 1074, and established in England by Anselm archbishop of Canterbury about the year 1175; though his predecessor Lanfranc had imposed it upon the prebendaries and clergy that lived in towns. And though the council of Trent was repeatedly petitioned by several princes and states to abolish this restraint, the obligation of celibacy was rather established than relaxed by this council; for they decreed, that marriage contracted after a vow of continence is neither lawful nor valid; and thus deprived the church of the possibility of ever restoring marriage to the clergy. For, if marriage, after a vow, be in itself unlawful, the greatest authority upon earth cannot dispense with it, nor permit marriage to the clergy, who have already vowed continence.

To the doctrines and practices above recited may be further added the worship of images, of which protestants accuse the papists. But to this accusation the papist replies, that he keeps images by him to preserve in his mind the memory of the persons represented by them; as people are wont to preserve the memory of their deceased friends by keeping their pictures. He is taught (he says) to use them so as to cast his eyes upon the pictures or images, and thence to raise his heart to the things represented, and there to employ it in meditation,

love, and thanksgiving, desire of imitation, &c. as the object requires.

These pictures or images have this advantage, that they inform the mind by one glance of what in reading might require a whole chapter; there being no other difference between them, than that reading represents leisurely and by degrees; and a picture, all at once. Hence he finds a convenience in saying his prayers with some devout pictures before him, he being no sooner distracted, but the sight of these recalls his wandering thoughts to the right object; and as certainly brings something good into his mind, as an immodest picture disturbs his heart with filthy thoughts. And because he is sensible that these holy pictures and images represent and bring to his mind such objects as in his heart he loves, honours, and venerates; he cannot but upon that account love, honour, and respect the images themselves.

The council of Trent likewise decreed, that all bishops and pastors who have the cure of souls do diligently instruct their flocks, that it is good and profitable to desire the intercession of saints reigning with Christ in heaven. And this decree the papists endeavour to defend by the following observations. They confess that we have but one Mediator of redemption; but affirm that it is acceptable to God that we should have many mediators of intercession. Moses (say they) was such a mediator for the Israelites; Job for his three friends; Stephen for his persecutors. The Romans were thus desired by St. Paul to be his mediators; so were the Corinthians, so the Ephesians, *Ep. ad Rom. Cor. Eph.*; so almost every sick man desires the congregation to be his mediators, by remembering him in their prayers. And so the papist desires the blessed in heaven to be his mediators; that is, that they would pray to God for him. But between these living and dead mediators there is no similarity; the living mediator is present, and certainly hears the request of those who desire him to intercede for them; the dead mediator is as certainly absent, and cannot possibly hear the requests of all those who at the same instant may be begging him to intercede for them, unless he be possessed of the divine attribute of omnipresence; and he who gives that attribute to any creature is unquestionably guilty of idolatry. And as this decree is contrary to one of the first principles of natural religion, so does it receive no countenance from scripture, or any Christian writer of the three first centuries. Other practices peculiar to the papists are the religious honour and respect that they pay to sacred relics; by which they understand not only the bodies and parts of the bodies of the saints, but any of those things that appertained to them, and which they touched; and the celebration of divine service in an unknown tongue: to which purpose the council of Trent hath denounced an anathema on any one who shall say that mass ought to be celebrated only in the vulgar tongue; sess. 25. and sess. 22. can. 9. Though the council of Lateran under

Innocent III. in 1215, (can. 9.) had expressly decreed, that because in many parts within the same city and diocese there are many people of different manners and rites mixed together, but of one faith, the bishops of such cities or dioceses should provide fit men for celebrating divine offices, according to the diversity of tongues and rites, and for administering the sacraments.

We shall only add, that the church of Rome maintains, that unwritten traditions ought to be added to the holy Scriptures, in order to supply their defect, and to be regarded as of equal authority; that the books of the Apocrypha are canonical scripture; that the vulgar edition of the Bible is to be deemed authentic; and that the scriptures are to be received and interpreted according to that sense which the holy mother church, to whom it belongs to judge of the true sense, hath held, and doth hold, and according to the unanimous consent of the fathers.

Such are the principal and distinguishing doctrines of popery, most of which have received the sanction of the council of Trent, and that of the creed of pope Pius IV. which is received, professed; and sworn to by every one who enters into holy orders in the church of Rome; and at the close of this creed we are told that the faith contained in it is so absolutely and indispensably necessary, that no man could be saved without it.

POPESEYE. *s.* (*pope* and *eye*.) The gland surrounded with fat in the middle of the thigh.

POPGUN. *s.* (*pop* and *gun*.) A gun with which children play, that only makes a noise (*Cheyne*).

POPILIUS. This name was common to many eminent Romans, the most conspicuous of whom is Lænas, a Roman ambassador to Antiochus, king of Syria. He was commissioned to order the monarch to abstain from hostilities against Ptolemy, king of Egypt, who was an ally of Rome. Antiochus wished to evade him by his answers, but Popilius, with a stick which he had in his hand, made a circle round him on the sand, and bade him in the name of the Roman senate and people not to go beyond it before he spoke decisively. This boldness intimidated Antiochus; he withdrew his garrisons from Egypt, and no longer meditated a war against Ptolemy.

POPINJAY, in ornithology. See **PSITTACUS**.

POPINJAY, is used by Shakspeare, to denote a trifling fop.

POPISH. *a.* (from *pope*.) Taught by the pope; relating to popery (*Hooker*).

POPISHLY. *ad.* With tendency to popery; in a popish manner (*Pope*).

POPLAR. See **POPULUS**.

POPLES. In anatomy. The ham or joint of the knee.

POPLITEAL ARTERY. (from *poples*, the ham.) The continuation of the crural artery, through the hollow of the ham.

POPLITEUS. From *poples*, the ham.

POPPY (Red corn). See **PAPAYER ERATICUM**.

POPPY (White). See **PAPAYER ALBUM**.

POPULACE. *s.* (*populace*, Fr. from *populus*, Lat.) The vulgar; the multitude (*Swift*).

POPULACY. *s.* (*populace*, French.) The common people; the multitude (*Decay of Piety*).

POPULAR. *a.* (*populaire*, Fr. *popularis*, Lat.) 1. Vulgar; plebeian (*Milton*). 2. Suitable to the common people; familiar; not critical (*Hooker*). 3. Beloved by the people; pleasing to the people (*Clarendon*). 4. Studious of the favour of the people (*Addison*). 5. Prevailing or raging among the populace: as, a popular distemper.

POPULARITY. *s.* (*popularitas*, Latin.) 1. Graciousness among the people; state of being favoured by the people (*Dryden*). 2. Representation suited to vulgar conception; what affects the vulgar (*Bacon*).

POPULARLY. *ad.* (from *popular*.) 1. In a popular manner; so as to please the crowd (*Dryden*). 2. According to vulgar conception (*Brown*).

To POPULATE. *v. n.* (from *populus*, Lat.) To breed people (*Bacon*).

POPULATION. *s.* (from *populate*.) The state of a country with respect to numbers of people (*Bacon*).

As we are not satisfied with any of the theories which have been proposed on this interesting subject, we shall simply place here a few results; and leave our readers to theorize as they please.

The population of Great Britain was long a subject of great uncertainty, both with respect to the actual number of inhabitants, and their increase or diminution. But many of the doubts have been removed, by the act for ascertaining the population of Great Britain, passed on the last day of the year 1800: it directed a general enumeration of houses, families, and persons; and the proper officers of the several parishes and places were ordered to take the account, on the 10th of March, 1801, in England and Wales; and in Scotland as soon as possible after that day. This difference was necessary, because in the colder climate of Scotland it was not certain that all parts of the country would be easily accessible so early in the year. An abstract of the returns was laid before both houses of parliament; and the summary of the enumeration, though unavoidably defective in some points, may be stated generally, as follows:

POPULATION.

	HOUSES.			PERSONS.		
	Inhabited.	By how many families occupied.	Uninhabited.	Males.	Females.	Total.
England.....	1,472,873	1,787,520	53,965	3,987,935	4,343,499	8,331,434
Wales	108,053	118,333	3,511	257,178	284,368	541,546
Scotland	294,633	364,379	9,537	734,581	864,487	1,599,068
Army, including militia.....	—	—	—	198,351	—	198,351
Navy, including marines.....	—	—	—	126,279	—	126,279
Seamen in registered shipping	—	—	—	144,558	—	144,558
Convicts on board the hulks	—	—	—	1,410	—	1,410
Total	1,875,456	2,269,902	67,013	5,450,292	5,492,354	10,942,646

The islands of Guernsey, Jersey, Alderney, and Sark, the Scilly Islands, and the Isle of Man, were not comprised in the enumeration; the total population of these islands has been usually estimated at about 80,000. The number of houses in Ireland has been nearly ascertained by the collection of a hearth-money tax, from whence it has been computed that the population of that part of the united kingdom somewhat exceeds four millions of persons. Therefore, with a very moderate allowance for those places from which no returns were received, and for omissions in others, the total population of the united kingdom of Great Britain and Ireland amounted to 15,100,000 persons.

At the beginning of the preceding century, Dr. Davenant published an account of the total number of houses in England and Wales, according to the hearth books of Lady Day 1690; this account was probably as correct as the above, and a comparison of them shows an increase from 1690 to 1801 of 261,708 houses, which at $5\frac{1}{2}$ persons to a house makes an increase of 1,465,563 persons. This appears to be the least increase that can have taken place, but it has certainly been greater on account of the number of soldiers and seamen far exceeding those employed in 1690.

A circumstance which caused considerable disagreement in the estimates, which previously to the enumeration, had been formed on this subject, was the want of sufficient accounts to determine the proportion of persons to a house. Dr. Davenant and Dr. Brakenridge reckoned six persons to a house; while Mr. G. King allowed rather more than $4\frac{1}{2}$ in London, $4\frac{1}{3}$ in the cities and market towns, and four in the villages. Dr. Price asserted that six persons to a house for London, and five to a house for all England, was too large an allowance; but the fact now appears to be, that in England and Wales the proportion is $5\frac{1}{2}$ persons to a house, and in Scotland $5\frac{1}{3}$.

The proportion of inhabitants to a house differs very considerably in some of the counties of England: the chief cause of this difference is the large towns, and particularly the sea-

ports which some of them contain, as in such places the inhabitants live more crowded together than in moderate sized inland towns. The difference in this respect between large towns and those of less extent will be shown with tolerable accuracy by the following statements.

Inhabitants.	Towns.	Persons to a House.
864,845 ..	London.....	$7\frac{1}{2}$
84,920 ..	Manchester	6 $\frac{1}{2}$
77,653 ..	Liverpool	6 $\frac{1}{2}$
63,645 ..	Bristol	6
43,194 ..	Plymouth	$9\frac{1}{2}$
32,200 ..	Bath	$7\frac{1}{2}$
32,166 ..	Portsmouth	6
29,516 ..	Hull	6 $\frac{1}{2}$
28,366 ..	Newcastle.....	9

The other towns in England containing upwards of twenty thousand inhabitants, are the following:

Inhabitants.	Towns.	Persons to a House.
73,670 ..	Birmingham.....	5
53,162 ..	Leeds.....	$4\frac{1}{2}$
36,832 ..	Norwich	$4\frac{1}{2}$
31,314 ..	Sheffield	$4\frac{1}{2}$
28,861 ..	Nottingham	$5\frac{1}{2}$

The latter are all manufacturing towns, the trade of which had for several years previously to the enumeration been in a very distressed situation, and had reduced the population much below its usual standard; a few years of peace will restore the inhabitants which these towns had lost, and reduce in some degree the population of the principal out-ports.

Proportion of persons to a house in towns of a moderate size.

Inhabitants.	Towns.	Persons to a House.
7,909 ..	Devizes	5
7,668 ..	Salisbury.....	$5\frac{1}{2}$
7,655 ..	Bury	$5\frac{1}{2}$
7,579 ..	Gloucester	$5\frac{1}{2}$
7,531 ..	Wellington.....	$5\frac{1}{2}$
7,398 ..	Lincoln	5
7,020 ..	Northampton.....	$5\frac{1}{2}$
6,828 ..	Hereford.....	5
6,730 ..	Newark	5
6,505 ..	Tiverton.....	$5\frac{1}{2}$
5,794 ..	Taunton	5

POPULATION.

Another enumeration was made in 1811, from the principal results of which, together with those of 1801, we are enabled to present the following comparative statement of the population of the several counties of Great Britain, in the years

1801 and 1811; showing the increase or diminution thereof: together with the present state of the returns called for by an act of the last session of parliament.

ENGLAND.

Counties.	Population, 1801.			Increase.	Diminution.	Population, 1811.		
	Males.	Females.	Total.			Males.	Females.	Total.
Bedford	30,523	32,870	63,393	6,820	—	33,171	37,042	70,213
Berks	52,821	56,394	109,215	9,062	—	57,360	60,917	118,277
Buckingham	52,094	55,350	107,444	10,206	—	56,208	61,442	117,650
Cambridge	44,081	45,265	89,346	11,763	—	50,756	50,353	101,109
Chester	92,759	98,992	191,751	35,280	—	110,844	116,190	227,031
Cornwall	89,868	98,401	188,269	28,398	—	103,310	113,357	216,667
Cumberland	54,377	62,853	117,230	16,514	—	63,433	70,311	133,744
Derby	79,401	81,746	161,142	24,345	—	91,494	93,993	185,487
Devon	157,240	185,761	343,001	40,307	—	179,553	203,755	383,308
Dorset	53,667	61,652	115,319	9,374	—	57,717	66,976	124,693
Durham	74,770	85,591	160,361	19,444	—	84,777	95,028	179,805
Essex	111,356	115,081	226,437	26,036	—	124,839	127,634	252,473
Gloucester	117,180	133,629	250,809	27,727	—	129,546	148,990	278,536
Hereford	43,955	45,236	89,191	4,882	—	46,404	47,669	94,073
Hertford	48,063	49,514	97,577	14,077	—	55,023	56,631	111,654
Huntingdon	18,521	19,047	37,568	4,640	—	20,402	21,806	42,208
Kent	151,374	156,250	307,624	63,261	—	181,925	188,960	370,885
Lancaster	322,356	350,375	672,731	155,578	—	394,104	434,205	828,309
Leicester	63,943	66,378	130,321	20,338	—	73,366	77,053	150,419
Lincoln	102,445	106,112	208,557	13,994	—	109,707	112,844	222,551
Middlesex	373,653	444,474	818,120	131,913	—	433,036	517,006	950,042
Monmouth	22,173	23,409	45,582	5,692	—	25,715	25,559	51,274
Norfolk	129,842	143,529	273,371	18,611	—	133,076	153,906	291,982
Northampton	63,417	68,340	131,757	9,596	—	68,279	73,074	141,353
Northumberland	73,357	83,744	157,101	15,060	—	80,385	91,776	172,161
Nottingham	68,558	71,792	140,350	22,580	—	79,057	83,843	162,900
Oxford	53,786	55,834	109,620	9,584	—	59,140	60,064	119,204
Rutland	7,978	8,378	16,356	44	—	7,931	8,449	16,380
Salop	82,563	85,076	167,639	27,061	—	96,038	98,662	194,700
Somerset	126,927	146,823	273,750	29,430	—	141,449	161,731	303,181
Southampton	105,667	113,789	219,456	25,691	—	118,434	126,913	245,347
Stafford	118,698	120,455	239,153	57,370	—	148,752	147,765	296,517
Suffolk	101,094	109,340	210,434	23,468	—	111,866	122,033	233,899
Surrey	127,128	141,905	269,033	54,808	—	151,811	172,040	323,851
Sussex	78,797	80,514	159,311	29,934	—	93,775	95,470	189,245
Warwick	99,942	108,248	208,190	10,703	—	104,487	114,406	218,893
Westmoreland	20,175	21,442	41,617	4,369	—	22,902	23,084	45,986
Wilts	87,380	97,727	185,107	8,721	—	91,560	102,268	193,828
Worcester	67,631	71,702	139,333	21,668	—	78,261	82,740	161,001
York, E. Riding	68,457	70,976	139,433	27,920	—	81,205	86,148	167,353
York, N. Riding	74,904	80,602	155,506	2,698	—	77,505	80,699	158,204
York, W. Riding	276,005	287,948	563,953	89,049	—	321,651	331,351	653,002
Totals	3,987,935	4,343,499	8,331,434	1,167,966	—	4,555,257	4,944,143	9,499,400

WALES.

Anglesey	15,775	18,031	33,806	3,286	—	17,467	19,625	37,092
Brecon	15,393	16,242	31,635	6,117	—	18,522	19,228	37,750
Cardigan	20,408	22,548	42,956	7,376	—	23,793	26,539	50,332
Carmarthen	31,439	35,878	67,317	9,900	—	36,080	41,137	77,217
Carnarvon	19,586	21,931	41,517	7,498	—	23,241	25,778	49,019
Denbigh	29,247	31,105	60,352	3,888	—	31,129	33,111	64,240
Flint	19,577	20,045	39,622	6,896	—	22,712	23,806	46,518
Glamorgan	34,190	37,335	71,525	9,743	—	39,378	41,890	81,268
Merioneth	13,896	15,610	29,506	1,418	—	14,308	16,616	30,924
Montgomery	22,914	25,064	47,978	2,628	—	24,760	25,846	50,606
Pembroke	25,406	30,874	56,280	4,335	—	27,453	33,162	60,615
Radnor	9,347	9,703	19,050	2,749	—	10,571	11,228	21,799
Totals	257,178	284,368	541,546	65,834	—	289,414	317,966	607,380

POPULATION.

SCOTLAND.

Shires.	Population 1801.			Increase.	Dimi- nution.	Population 1811.		
	Males.	Females.	Total.			Males.	Females.	Total.
Aberdeen	55,625	67,457	123,082	13,821	—	60,973	75,930	136,903
Argyll	33,767	38,092	71,859	13,726	—	40,675	44,910	85,585
Ayr	39,666	44,640	84,306	19,648	—	48,506	55,448	103,954
Banff	16,067	19,740	35,807	—	1707	14,911	19,189	34,100
Berwick	14,294	16,327	30,621	158	—	14,466	16,313	30,779
Bute	5,552	6,239	11,791	242	—	5,545	6,488	12,033
Caithness	10,183	12,426	22,609	810	—	10,608	12,811	23,419
Clackmannan	5,064	5,794	10,858	1,152	—	5,715	6,295	12,010
Dumbarton	9,796	10,914	20,710	3,479	—	11,369	12,820	24,189
Dumfries	25,407	29,190	54,597	8,363	—	29,347	33,613	62,960
Edinburgh	54,224	68,730	122,954	25,490	—	64,900	83,541	148,441
Elgin	11,763	14,942	26,705	1,403	—	12,401	15,707	28,108
Fife	42,952	50,791	93,743	7,529	—	45,986	55,304	101,272
Forfar	45,461	53,666	99,127	8,137	—	48,151	59,113	107,264
Haddington	13,890	16,096	29,986	1,178	—	14,232	16,932	31,164
Inverness	33,801	40,491	74,292	4,123	—	35,749	42,666	78,415
Kincairdine	12,104	14,245	26,349	1,090	—	12,580	14,859	27,439
Kinross	3,116	3,609	6,725	520	—	3,466	3,779	7,245
Kirkcudbright	13,619	15,592	29,211	4,473	—	14,788	17,896	32,684
Lanark	68,100	78,599	146,699	45,053	—	88,688	103,064	191,752
Linlithgow	8,129	9,715	17,844	1,607	—	8,874	10,577	19,451
Nairn	3,639	4,618	8,257	—	6	3,530	4,721	8,251
Orkney and Shet- land	20,793	26,031	46,824	—	671	20,151	26,002	46,153
Peebles	4,160	4,575	8,735	1,200	—	4,846	5,089	9,935
Perth	58,808	67,558	126,366	8,727	—	64,034	71,059	135,093
Renfrew	36,068	41,988	78,056	14,540	—	41,960	50,636	92,596
Ross & Cromarty	25,494	29,849	55,343	5,510	—	27,640	33,213	60,853
Roxburgh	15,813	17,869	33,682	3,548	—	17,113	20,117	37,230
Selkirk	2,356	2,714	5,070	819	—	2,750	3,139	5,889
Stirling	23,875	26,950	50,825	7,349	—	27,745	30,429	58,174
Sutherland	10,425	12,692	23,117	512	—	10,488	13,141	23,629
Wigtown	10,570	12,348	22,918	3,973	—	12,205	14,686	26,891
Total	734,581	864,487	1,599,068	208,180	2384	825,377	979,487	1,804,864

SUMMARY.

	Population 1801.			Increase.	Dimi- nution.	Population 1811.		
	Males.	Females.	Total.			Males.	Females.	Total.
England	3,987,935	4,343,499	8,331,434	1,167,966	—	4,555,257	4,944,143	9,499,400
Wales	257,178	284,368	541,546	65,834	—	289,414	317,966	607,380
Scotland	734,581	864,487	1,599,068	208,180	2384	825,377	979,487	1,804,864
Army, Navy, &c.	470,598	—	470,598	169,902	—	640,500	—	640,500
Total	5,450,292	5,492,354	10,942,646	1,611,882	2384	6,310,548	6,241,596	12,552,144

Remarks.—1. In order that the comparative statement of the population of the several counties in 1801 and 1811 might be made as perfect as the present state of the returns of 1811 permits, the few outstanding deficiencies have been supplied from the returns of 1801; and it is supposed that the uncertainty thence arising can scarcely amount to a thousand persons in any one of the few incomplete counties, excepting only in Monmouthshire. The apparent diminution in Banffshire chiefly arises from three parishes, being now returned wholly in neighbouring counties, which parishes in 1801 were

returned partly or wholly in Banffshire. 2. The number of males composing the army, navy, &c. includes the regular army, the artillery, and the British regular militia, all according to the latest returns to parliament; but the regiments of local militia, which were embodied for training and exercise on the 27th May, 1811, have been ascribed to their respective counties. With the navy are included the royal marines: and to all these are added the seamen employed in navigating registered vessels. 3. The larger abstracts, both of the enumeration and parish register returns, will be

presented to parliament when the respective returns shall have been completed; in furtherance of which purpose, letters and blank schedules have been dispatched to all the places where any deficiency is supposed to exist.

An attempt was made to ascertain the population of France, by command of the government, in the tenth year of the republic, but the account does not appear to have been very accurately taken. The total population of the 102 departments into which France was then divided was stated at 33,104,343 persons, over an extent of about 185,600 square miles. This account included thirteen departments incorporated with the north of France, four departments in the south, and some smaller acquisitions, comprehending in the whole 23,790 square miles, containing 5,114,419 inhabitants.

The following is a comparative view of the population of the principal sea ports and manufacturing towns of Great Britain, and of France.

GREAT BRITAIN.

FRANCE.

Inhabitants.

Inhabitants.

London.....	864,845	Paris.....	546,856
Manchester	84,020	Bordeaux	112,844
Edinburgh	82,560	Lyons.....	109,500
Liverpool.....	77,653	Marseilles ..	111,130
Glasgow.....	77,385	Rouen.....	87,000
Birmingham...	73,670	Nantes.....	73,649
Bristol.....	63,645	Brussels....	66,227
Leeds.....	53,162	Lisle.....	54,756
Plymouth.....	43,194	Toulouse....	50,171
Norwich.....	36,832	Strasbourg ..	49,056
Portsmouth...	32,166	Cologne.....	38,844
Sheffield.....	31,314	Bruges.....	33,700
Hull.....	29,516	Gunkirk.....	21,158
Nottingham...	28,861	Brest.....	27,000
Newcastle.....	28,366	Toulon.....	20,500

POPULOSITY. *s.* (from *populous*.) Populousness; multitude of people (*Brown*).

POPULOUS. *a.* (*populosus*, Latin.) Full of people; numerous inhabited (*Milton*).

POPULOUSLY. *ad.* With much people.

POPULOUSNESS. *s.* (from *populous*.) The state of abounding with people (*Temple*).

POPULUS. Poplar. In botany, a genus of the class dioecia, order octandria. Calyx a lacinated scale of the ament; corol turbinate, oblique, entire.—Twelve species; natives of Europe and America; four of them of our own country. They are all cultivated for some purpose or other, and are as follow:

1. *P. alba*. White poplar. Found wild in our own woods; tall, straight, with a smooth whitish bark; leaves heart-roundish, lobed, toothed, white-downy underneath; aments ovate.

There are two varieties: the common white poplar; and the great white poplar, or abele.

2. *P. tremula*. Trembling poplar. Aspen. Found wild in our woods; its leaves trembling with every breath of wind, the plane of the long petioles being at right angles to that of their leaves, whence a peculiar freedom of motion.

3. *P. nigra*. Black poplar. Found in wa-

try places in our own country, and other parts of Europe. Its inner bark is used by the inhabitants of Kamschatka as a material for bread; and the downy cotton of its seeds has been sometimes employed for paper. The young buds, oculi, or rudiments of the leaves, which appear in the beginning of the spring, were formerly employed in an official ointment. At present they are almost entirely disregarded, though they should seem, from their sensible qualities, to be applicable to purposes of some importance. They have a yellow, unctuous, odorous, balsamic juice. The bark being lighter than cork serves to support fishing nets. The wood is not apt to splinter, and is hence occasionally used by turners; it also affords rafters, poles, and railing, and is employed for flooring in several counties.

4. *P. dilatata*. Lombardy poplar: approaching to the cypress in the compressed form of its growth. A native of Lombardy.

5. *P. balsamifera*. Tacamahac. This name is given to several other plants, and especially to the fagara octandra, and the calophyllum inophyllum. In truth, each of these yields a glutinous resin of a similar kind, which is sold under the name of gum-tacamahac in the shops; though the best is that obtained from *C. inophyllum*. See for the medical properties of this secretion the article **TACAMAHAC**. It is a native of America and Siberia.

6. *P. candicans*. Heart-leaved tacamahac poplar. This secretes also a resinous gum; and is a native of Canada.

7. *P. lavigata*. Smooth poplar. A native of North America: flowering in March and April.

8. *P. monilifera*. Canadian poplar. Indigenous to Canada: flowers in May.

9. *P. Græca*. Athenian poplar. Broad leaves; a native of the Archipelago: flowers in March and April.

10. *P. heterophylla*. Various-leaved poplar. Tree large; branches numerous; leaves broad. A native of Virginia and New York: flowers in April and May.

11. *P. angulata*. Carolina poplar. Covered with a light-green bark, like some sorts of willow, growing greyer as the tree advances in years. A large Carolina tree: flowering in March.

12. *P. canescens*. Hoary poplar; with large roundish leaves, hoary underneath. Found in watry places in our own country.

They may be all increased by cuttings, layers, or suckers. Most of the species may be usefully employed in dyeing; yielding to wool a good nut, fawn, nankeen, and similar grave colours, according to the quantity of wood employed and the length of time consumed in boiling.

PORA, an island in the Indian ocean, on the W. coast of Sumatra, 54 miles long, and from 9 to 12 broad. Lon. 98. 30 E. Lat. 1. 10 S.

PORANA, in botany, a genus of the class pentandria, order monogynia. Corol campanulate; calyx five-cleft, in fruit larger; style

semibifid, longer, permanent; stigma globular; pericarp two-valved. One species; a twining shrub of India.

PORCELAIN, a substance of a middle nature between pottery and glass, produced by an incipient fusion of the different earths that compose it, which are hereby rendered hard, sonorous, and semitransparent, and possess an imperfect conchoidal or vitreous fracture. See the article **POTTERY**.

PORCELAIN CLAY, in mineralogy. See **ARGILLA**.

PORCELAIN SHELL. See **CYPRÆA**.

PORCELLANITE, in mineralogy. See **JASPER**.

PORCH, in architecture, a kind of vestibule supported by columns; much used at the entrance of the ancient temples, halls, churches, &c. A porch, in the ancient architecture, was a vestibule, or a disposition of insulated columns usually crowned with a pediment, forming a covert place before the principal door of a temple or court of justice. Such was that before the door of St. Paul's, Covent-Garden, the work of Inigo Jones. When a porch had four columns in front, it was called a tetrastyle; when six, hexastyle; when eight, octostyle, &c.

PORCH, in Greek *γῶν*, a public portico in Athens, adorned with the pictures of Polygnottus and other eminent painters. It was in this portico that Zeno the philosopher taught; and hence his followers were called Stoics. See **STOICS** and **ZENO**.

PORCHESTER, a village in Hampshire, four miles N. of Portsmouth, at the upper end of the harbour, between Fareham and Portsea island. It has an ancient castle, which has served of late years for the reception of prisoners of war, and ordnance stores.

PORCIA, a sister of Cato, of Utica, greatly commended by Cicero. 2. A daughter of Cato, of Utica, who married Bibulus, and after his death, Brutus. She was remarkable for her prudence, philosophy, courage, and conjugal tenderness. So great was her firmness and constancy, that Brutus communicated to her the conspiracy which he and many other illustrious Romans had formed against J. Cæsar. Porcia wished them success, and dropped nothing which might affect the situation of the conspirators. When Brutus was dead she refused to survive him, and attempted to end her life as a daughter of Cato; and when she saw that every weapon was removed from her reach, she swallowed burning coals, and died about 48 years before the Christian era.

PORCO, a town of Peru, capital of a jurisdiction in the diocese of Plata. It has its name from a mountain, rich in silver, and its mine was the first worked by the Spaniards after the conquest. It is 25 miles W.S.W. of Potosi. Lon. 67. 20 W. Lat. 19, 40 S.

PORCUPINE, in mastiology. See **HYSTRIX**.

PORCUPINE MAN, the name by which one Edward Lambert, who had a distempered skin, went in London. We have the following ac-

count of him in the Philosophical Transactions for 1755, by Mr. Henry Baker, F. R. S. "He is now (says he) 40 years of age, and it is 24 years since he was first shown to the society. The skin of this man, except on his head and face, the palms of his hands, and the soles of his feet, is covered with excrescences that resemble an innumerable company of warts, of a brown colour and cylindrical figure; all rising to an equal height, which is about an inch, and growing as close as possible to each other at their bases; but so stiff and elastic as to make a rustling noise when the hand is drawn over them. These excrescences are annually shed, and renewed in some of the autumn or winter months. The new ones, which are of a paler colour, gradually rise up from beneath as the old ones fall off; and at this time it has been found necessary for him to lose a little blood, to prevent a slight sickness which he had been used to suffer before this precaution was taken. He has had the small pox, and he has been twice salivated, in hopes to get rid of this disagreeable covering; but though, just when the pustules of the small-pox had scaled off, and immediately after his salivations, his skin appeared white and smooth, yet the excrescences soon returned by a gradual increase, and his skin became as it was before. His health during his whole life has been remarkably good; but there is one particular of this case more extraordinary than all the rest: this man has had six children, and all of them had the same rugged covering as himself, which came on like his own about nine weeks after the birth. Of these children only one is now living, a pretty boy, who was shown with his father. It appears, therefore (as Mr. Baker remarks), that a race of people might be propagated by this man, as different from other men as an African is from an Englishman; and that if this should have happened in any former age, and the accidental original have been forgotten, there would be the same objections against their being derived from the same common stock with others: it must therefore be admitted possible, that the differences now subsisting between one part of mankind and another, may have been produced by some such accidental cause, long after the earth has been peopled by one common progenitor." See **HOMO** and **MAN**.

PORE. *s.* (*pore*, Fr. *poré*.) 1. Spiracle of the skin; passage of perspiration (*Bacon*). 2. Any narrow spiracle or passage (*Quincy*).

To PORE. *v. n.* To look with great intensesness and care; to examine with great attention.

POREBLIND. *a.* (*pore* and *blind*: commonly spoken and written *purbblind*.) Near-sighted; shortsighted (*Bacon*).

PORENTRU, a town of France, capital of the department of Mont Terrible. It lately belonged to Switzerland, and was the capital of the bishopric of Basel. It is seated on the Hallan, near Mount Jura, 24 miles W.S.W. of Basel. Lon. 7. 10 E. Lat. 47. 27 N.

PORI BILIARII, in anatomy, the biliary pores or ducts that receive the bile from the

P O R I S M.

penicilli of the liver, and convey it to the hepatic duct.

PORINESS. *s.* (from *pore*.) Fulness of pores (*Wiseman*).

PORISM, *porisma*, in geometry, has by some been defined a general theorem, or canon, deduced from a geometrical locus, and serving for the solution of other general and difficult problems. Proclus derives the word from the Greek *πορίστω*, I establish, and conclude from something already done and demonstrated: and accordingly he defines *porisma* a theorem drawn occasionally from some other theorem already proved: in which sense it agrees with what is otherwise called corollary.

Pappus says, a porism is that in which something was proposed to be investigated.

Others derive it from *πορος*, a passage, and make it of the nature of a lemma, or a proposition necessary for passing to another more important one.

But Dr. Simson, rejecting the erroneous accounts that have been given of a porism, defines it a proposition, either in the form of a problem or a theorem, in which it is proposed either to investigate or demonstrate.

Euclid wrote three books of porisms, being a curious collection of various things relating to the analysis of the more difficult and general problems. Those books however are lost; and nothing remains in the works of the ancient geometers concerning this subject besides what Pappus has preserved, in a very imperfect and obscure state, in his Mathematical Collections, viz. in the introduction to the 7th book.

Several attempts have been made to restore these writings in some degree, besides that which Pappus has left upon the subject. Thus, Fermat has given a few propositions of this kind; which are to be found in the collection of his works, in folio, 1679, pa. 116. The like was done by Bullialdus, in his *Exercitationes Geometricæ*, 4to. 1657. Dr. Robert Simson gave also a specimen, in two propositions, in the *Philos. Trans.* vol. 32, pa. 330; and besides left behind him a considerable treatise on the subject of porisms, which has been printed in an edition of his works, at the expense of the earl of Stanhope, in 4to. 1776.

The whole three books of Euclid were also restored by that ingenious mathematician Albert Girard, as appears by two notices that he gave, first in his *Trigonometry*, printed in French, at the Hague, in 1629, and also in his edition of the works of Stevinus, printed at Leyden in 1634, pa. 459; but whether his intention of publishing them was ever carried into execution I have not been able to learn.

A learned paper on the subject of porisms, by the very ingenious professor Playfair, has also been inserted in the 3d volume of the *Transactions of the Royal Society of Edinburgh*. As this paper contains a number of curious observations on the geometry of the ancients in general, as well as forms a complete treatise as it were on porism in particular, a pretty considerable abstract of it cannot but be deemed in this place very useful and important.

"The restoration of the ancient books of geometry (says the learned professor) would have been impossible without the coincidence of two circumstances, of which, though the one is purely accidental, the other is essentially connected with the nature of the mathematical sciences. The first of

these circumstances is the preservation of a short abstract of those books drawn up by Pappus Alexandrinus, together with a series of such lemmata as he judged useful to facilitate the study of them. The second is the necessary connection that takes place among the objects of every mathematical work, which, by excluding whatever is arbitrary, makes it possible to determine the whole course of an investigation when only a few points in it are known. From the union of these circumstances mathematics has enjoyed an advantage of which no other branch of knowledge can partake; and while the critic or the historian has only been able to lament the fate of those books of Livy and Tacitus which are lost, the geometer has had the high satisfaction to behold the works of Euclid and Apollonius reviving under his hands.

"The first restorers of the ancient books were not, however, aware of the full extent of the work which they had undertaken. They thought it sufficient to demonstrate the propositions which they knew from Pappus to have been contained in those books; but they did not follow the ancient method of investigation, and few of them appear to have had any idea of the elegant and simple analysis by which these propositions were originally discovered, and by which the Greek geometry was peculiarly distinguished.

"Among these few, Fermat and Halley are to be particularly remarked. The former, one of the greatest mathematicians of the last age, and a man in all respects of superior abilities, had very just notions of the geometrical analysis, and appears often abundantly skilful in the use of it; yet in his restoration of the *Loci Plani*, it is remarkable, that in the most difficult propositions he lays aside the analytical method, and contents himself with giving the synthetical demonstration. The latter, among the great number and variety of his literary occupations, found time for a most attentive study of the ancient mathematicians, and was an instance of, what experience shews to be much rarer than might be expected, a man equally well acquainted with the ancient and the modern geometry, and equally disposed to do justice to the merit of both. He restored the books of Apollonius, on the problem *De Sectione Spatii*, according to the true principles of the ancient analysis.

"These books, however, are but short, so that the first restoration of considerable extent that can be reckoned complete is that of the *Loci Plani* by Dr. Simson, published in 1749, which, if it differs at all from the work it is intended to replace, seems to do so only by its greater excellence. Thus much at least is certain, that the method of the ancient geometers does not appear to greater advantage in the most entire of their writings than in the restoration above mentioned; and that Dr. Simson has often sacrificed the elegance to which his own analysis would have led, in order to tread more exactly in what the lemmata of Pappus pointed out to him as the track which Apollonius had pursued.

"There was another subject, that of porisms, the most intricate and enigmatical of any thing in the ancient geometry, which was still reserved to exercise the genius of Dr. Simson, and to call forth that enthusiastic admiration of antiquity, and that unwearied perseverance in research, for which he was so peculiarly distinguished. A treatise in three books, which Euclid had composed on porisms, was lost, and all that remained

concerning them was an abstract of that treatise, inserted by Pappus Alexandrinus in his Mathematical Collections, in which, had it been entire, the geometers of later times would doubtless have found wherewithal to console themselves for the loss of the original work. But unfortunately, it has suffered so much from the injuries of time, that all that we can immediately learn from it is, that the ancients put a high value on the propositions which they called porisms, and regarded them as a very important part of their analysis. The porisms of Euclid are said to be, 'Collectio artificiosissima multarum rerum quæ spectant ad analysin difficiliorum et generalium problematum.' The curiosity, however, which is excited by this encomium is quickly disappointed; for when Pappus proceeds to explain what a porism is, he lays down two definitions of it, one of which is rejected by him as imperfect, while the other, which is stated as correct, is too vague and indefinite to convey any useful information.

"These defects might nevertheless have been supplied, if the enumeration which he next gives of Euclid's Propositions had been entire; but on account of the extreme brevity of his enunciations, and their reference to a diagram which is lost, and for the constructing of which no directions are given, they are all, except one, perfectly unintelligible. For these reasons, the fragment in question is so ob-scure, that even to the learning and penetration of Dr. Halley, it seemed impossible that it could ever be explained; and he therefore concluded, after giving the Greek text with all possible correctness, and adding the Latin translation, 'Hactenus porismatum descriptio nec mihi intellecta, nec lectori profutura. Neque aliter fieri potuit, tam ob defectum schematis cujus sit mentio, quam ob omnia quædam et transposita, vel aliter vitiata in propositionis generalis expositione, unde quid sibi velit Pappus haud mihi datum est conjicere. His adde dictio-nis modum nimis contractum, ac in re difficili, qualis hæc est, minime usurpandum.'

"It is true, however, that before this time, Fermat had attempted to explain the nature of porisms, and not altogether without success. Guiding his conjectures by the definition which Pappus censures as imperfect, because it defined porisms only 'ab accidente,' viz. 'porisma est quod deficit hypothesi a Theoremate Locali,' he formed to himself a tolerably just notion of these propositions, and illustrated his general description by examples that are in effect porisms. But he was able to proceed no farther; and he neither proved that his notion of a porism was the same with Euclid's, nor attempted to restore or explain any one of Euclid's propositions; much less did he suppose, that they were to be investigated by an analysis peculiar to themselves. And so imperfect indeed was this attempt, that the complete restoration of the porisms was necessary to prove, that Fermat had even approximated to the truth.

"All this did not, however, deter Dr. Simson from turning his thoughts to the same subject, which he appears to have done very early, and long before the publication of the *Loci Plani* in 1749.

"The account he gives of his progress, and of the obstacles he encountered, will be always interesting to mathematicians. 'Postquam vero apud Pappum legeram, Porismata Euclidis collectionem fuisse artificiosissimam multarum rerum, quæ spectant ad analysin difficiliorum et genera-

lium problematum, magno desiderio tenebar, aliquid de iis cognoscendi; quare sæpius et multis variisque viis tum Pappi propositionem generalem, mancā et imperfectā, tum primum lib. i.

'Porisma, quod solum ex omnibus in tribus libris integrum adhuc manet, intelligere et restituerē conabar; frustra tamen, nihil enim proficiebam. Cumque cogitationes de hac re multum mihi temporis consumperint, atque molestæ admodum evaserint, firmiter animum induxi hæc nunquam in posterum investigare; præsertim cum optimus geometra Halæius spem omnem de iis intelligendis abjecisset. Unde quoties menti occurrerant, toties eas arcebam. Postea tamen accidit, ut improvidum et propositi immemorem, invaserint, meque detinuerint donec tandem lux quædam effulserit, quæ spem mihi faciebat inveniendi saltem Pappi propositionem generalem, quam quidem multa investigatione tandem restitui. Hæc autem paulo post una cum Porismate primo lib. i. impressa est inter Transactiones Phil. anni 1723, num. 177.'

"The propositions mentioned, as inserted in the Philosophical Transactions for 1723, are all that Dr. Simson published on the subject of porisma during his life, though he continued his investigations concerning them, and succeeded in restoring a great number of Euclid's propositions, together with their analysis. The propositions thus restored form a part of that valuable edition of the posthumous works of this geometer which the mathematical world owes to the munificence of the late earl Stanhope.

"The subject of porisms is not, however, exhausted, nor is it yet placed in so clear a light as to need no farther illustration. It yet remains to enquire into the probable origin of these propositions, that is to say, into the steps by which the ancient geometers appear to have been led to the discovery of them.

"It remains also to point out the relations in which they stand to the other classes of geometrical truths; to consider the species of analysis, whether geometrical or algebraical, that belongs to them; and, if possible, to assign the reason why they have so long escaped the notice of modern mathematicians. It is to these points that the following observations are chiefly directed.

"I begin with describing the steps that appear to have led the ancient geometers to the discovery of porisms; and must here supply the want of express testimony by probable reasonings, such as are necessary, whenever we would trace remote discoveries to their sources, and which have more weight in mathematics than in any other of the sciences.

"It cannot be doubted, that it has been the solution of problems, which, in all states of the mathematical sciences, has led to the discovery of most geometrical truths. The first mathematical enquiries, in particular, must have occurred in the form of questions, where something was given, and something required to be done; and by the reasonings necessary to answer these questions, or to discover the relation between the things that were given, and those that were to be found, many truths were suggested, which came afterwards to be subjects of separate demonstration. The number of these was the greater, that the ancient geometers always undertook the solution of problems with a scrupulous and minute attention, which would scarcely suffer any of the collateral truths to escape their observation. We know,

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from the examples which they have left us, that they never considered a problem as resolved, till they had distinguished all its varieties, and evolved separately, every different case that could occur, carefully remarking whatever change might arise in the construction, from any change that was supposed to take place among the magnitudes which were given.

"Now, as this cautious method of proceeding was not better calculated to avoid error, than to lay hold of every truth that was connected with the main object of enquiry, these geometers soon observed, that there were many problems which, in certain circumstances, would admit of no solution whatever, and that the general construction by which they were resolved would fail, in consequence of a particular relation being supposed among the quantities which were given.

"Such problems were then said to become impossible; and it was readily perceived, that this always happened, when one of the conditions prescribed was inconsistent with the rest, so that the supposition of their being united in the same subject, involved a contradiction. Thus, when it was required to divide a given line, so that the rectangle under its segment, should be equal to a given space, it was evident, that if this space was greater than the square of half the given line, the thing required could not possibly be done; the two conditions, the one defining the magnitude of the line, and the other that of the rectangle under its segments, being then inconsistent with one another. Hence an infinity of beautiful propositions concerning the maxima and the minima of quantities, or the limits of the possible relations which quantities may stand in to one another.

"Such cases as these would occur even in the solution of the simplest problems; but when geometers proceeded to the analysis of such as were more complicated, they must have remarked, that their constructions would sometimes fail, for a reason directly contrary to that which has now been assigned. Instances would be found where the lines that, by their intersection, were to determine the thing sought, instead of intersecting one another, as they did in general, or of not meeting at all, as in the above-mentioned case of impossibility, would coincide with one another entirely, and leave the question of consequence unresolved. But though this circumstance must have created considerable embarrassment to the geometers who first observed it, as being perhaps the only instance in which the language of their own science had yet appeared to them ambiguous or obscure, it would not probably be long till they found out the true interpretation to be put on it. After a little reflection, they would conclude, that since, in the general problem, the magnitude required was determined by the intersection of the two lines above mentioned, that is to say, by the points common to them both; so, in the case of their coincidence, as all their points must afford a solution; which solutions therefore must be infinite in number; and also, though infinite in number, they must all be related to one another, and to the things given, by certain laws, which the position of the two coinciding lines must necessarily determine.

"On enquiring farther into the peculiarity in the state of the data which had produced this unexpected result, it might likewise be remarked, that the whole proceeded from one of the condi-

tions of the problem involving another, or necessarily including it; so that they both together made in fact but one, and did not leave a sufficient number of independent conditions, to confine the problem to a single solution, or to any determinate number of solutions. It was not difficult afterwards to perceive, that these cases of problems formed very curious propositions, of an intermediate nature between problems and theorems, and that they admitted of being enunciated separately, in a manner peculiarly elegant and concise. It was to such propositions, so enunciated, that the ancient geometers gave the name of porisms.

"This deduction requires to be illustrated by examples." Mr. Playfair then gives several problems by way of illustration; one of which, which may here suffice to shew the method, is as follows:

"A triangle ABC being given, and also a point D, to draw through D a straight line DG, such, that, perpendiculars being drawn to it from the three angles of the triangle, viz. AE, BG, CF, the sum of the two perpendiculars on the same side of DG, shall be equal to the remaining perpendicular: or, that AE and BG together, may be equal to CF: pl. 139, fig. 8.

"Suppose it done: bisect AB in H, join CH, and draw HK perpendicular to DG.

"Because AB is bisected in H, the two perpendiculars AE and BG are together double of HK; and as they are also equal to CF by hypothesis, CF must be double of HK; and CL of LH. Now, CH is given in position, and magnitude; therefore the point L is given; and the point D being also given, the line DL is given in position, which was to be found.

"The construction was obvious. Bisect AB in H, join CH, and take HL equal to one third of CH; the straight line which joins the points D and L is the line required.

"Now, it is plain, that while the triangle ABC remains the same, the point L also remains the same, wherever the point D may be. The point D may therefore coincide with L; and when this happens, the position of the line to be drawn is left undetermined; that is to say, any line whatever drawn through L will satisfy the conditions of the problem. Here, therefore, we have another indefinite case of a problem, and of consequence another porism, which may be thus enunciated: 'A triangle being given in position, a point in it may be found, such, that any straight line whatever being drawn through that point, the perpendiculars drawn to this straight line from the two angles of the triangle which are on one side of it, will be together equal to the perpendicular that is drawn to the same line from the angle on the other side of it.

"This porism may be made much more general; for if, instead of the angles of a triangle, we suppose ever so many points to be given in a plane, a point may be found such, that any straight line being drawn through it, the sum of all the perpendiculars that fall on that line from the given points on one side of it, is equal to the sum of the perpendiculars that fall on it from all the points on the other side of it.

"Or still more generally, any number of points being given not in the same plane, a point may be found, through which if any plane be supposed to pass, the sum of all the perpendiculars which fall on that plane from the points on one side of it, is equal to the sum of all the perpendiculars that fall on the same plane from the points on the

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other side of it. It is unnecessary to observe, that the point to be found in these propositions, is no other than the centre of gravity of the given points; and that therefore we have here an example of a porism very well known to the modern geometers, though not distinguished by them from other theorems."

After some examples of other porisms, and remarks upon them, the author then adds,

"From this account of the origin of porisms, it follows, that a porism may be defined, a proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate, or capable of innumerable solutions."

"To this definition, the different characters which Pappus has given will apply without difficulty. The propositions described in it like those which he mentions, are, strictly speaking, neither theorems nor problems, but of an intermediate nature between both; for they neither simply enunciate a truth to be demonstrated, nor propose a question to be solved: but are affirmations of a truth, in which the determination of an unknown quantity is involved. In as far therefore as they assert, that a certain problem may become indeterminate, they are of the nature of theorems; and in as far as they seek to discover the conditions by which that is brought about, they are of the nature of problems."

"In the preceding definition also, and the instances from which it is deduced, we may trace that imperfect description of porisms which Pappus ascribes to the later geometers, viz. '*Porisma est quod deficit hypothesi a theoremate locali*.' Now, to understand this, it must be observed, that if we take the converse of one of the propositions called loci, and make the construction of the figure a part of the hypothesis, we have what was called by the ancients a local theorem. And again, if, in enunciating this theorem, that part of the hypothesis which contains the construction be suppressed, the proposition arising from thence will be a porism; for it will enunciate a truth, and will also require, to the full understanding and investigation of that truth, that something should be found, viz. the circumstance in the construction, supposed to be omitted."

"Thus when we say; if from two given points *E* and *D* (fig. 9), two lines *EF* and *FD* are inflected to a third point *F*, so as to be to one another in a given ratio, the point *F* is in the circumference of a circle given in position: we have a locus."

"But when conversely it is said; If a circle *ABC*, of which the centre is *O*, be given in position, as also a point *E*, and if *D* be taken in the line *EO*, so that the rectangle *EO. OD* be equal to the square of *AO*, the semidiameter of the circle; and if from *E* and *D*, the lines *EF* and *DF* be inflected to any point whatever in the circumference *BC*; the ratio of *EF* to *DF* will be a given ratio, and the same with that of *EA* to *AD*: we have a local theorem."

"And, lastly, when it is said; If a circle *ABC* be given in position, and also a point *E*, a point *D* may be found, such, that if the two lines *EF* and *FD* be inflected from *E* and *D* to any point whatever *F*, in the circumference, these lines shall have a given ratio to one another: the proposition becomes a porism."

"Here it is evident, that the local theorem is changed into a porism, by leaving out what relates to the determination of the point *D*, and of the given ratio. But though all propositions formed in this way, from the conversion of loci, be

porisms, yet all porisms are not formed from the conversion of loci. The first and second of the preceding, for instance, cannot by conversion be changed into loci; and therefore the definition which describes all porisms as being so convertible, is not sufficiently comprehensive. Fermat's idea of porisms, as has been already observed, was founded wholly on this definition, and therefore could not fail to be imperfect."

"It appears, therefore, that the definition of porisms given above agrees with Pappus's idea of these propositions, as far at least as can be collected from the imperfect fragments which contain his general description of them. It agrees also with Dr. Simson's definition, which is this: '*Porisma est propositio in qua proponitur demonstrare rem aliquam, vel plures datas esse, cui, vel quibus, ut et cuilibet ex rebus innumeris, non quidem datis, sed quæ ad eâ quæ data sunt eandem habent relationem, convenire ostendendum est affectionem quandam communem in propositione descriptam*.'"

"It cannot be denied, that there is a considerable degree of obscurity in this definition, notwithstanding of which it is certain, that every proposition to which it applies must contain a problematical part, viz. '*in qua proponitur demonstrare rem aliquam, vel plures datas esse*,' and also a theoretical part, which contains the property, or *communis affectio*, affirmed of certain things which have been previously described."

"It is also evident, that the subject of every such proposition is the relation between magnitudes of three different kinds; determinate magnitudes which are given; determinate magnitudes which are to be found; and indeterminate magnitudes which, though unlimited in number, are connected by the others by some common property. Now, these are exactly the conditions contained in the definitions that have been given here."

"To confirm the truth of this theory of the origin of porisms, or at least the justness of the notions founded on it, I must add a quotation from an essay on the same subject, by a member of this society, the extent and correctness of whose views make every coincidence with his opinions peculiarly flattering. In a paper read several years ago before the Philosophical Society, Professor Dugald Stewart defined a porism to be '*A proposition affirming the possibility of finding one or more of the conditions of an indeterminate theorem*.' Where, by an indeterminate theorem, as he had previously explained it, is meant one which expresses a relation between certain quantities that are indeterminate, both in magnitude and in number. The near agreement of this with the definition and explanations which have been given above, is too obvious to require to be pointed out; and I have only to observe, that it was not long after the publication of Simson's posthumous works, when, being both of us occupied in speculations concerning porisms, we were led separately to the conclusions which I have now stated."

For more on this subject, see Hutton's Mathematical Dictionary, article PORISM; also a very ingenious paper on Porisms by Henry Brougham, esq. in the Philosophical Transactions for 1798, or New Abridgment, vol. xviii. pa. 345—355.

PORISTIC METHOD. (ΠΟΡΙΣΤΙΚΗ.) In mathematics, is that which determines when, by what means, and how many different ways, a problem may be resolved,

PORK. *s.* (*porc*, Fr. *porcus*, Latin.) The flesh of swine killed for the purposes of food. If it have been pickled it is then called bacon.

PORKER. *s.* (from *pork*.) A hog; a pig (*Pope*).

PORKEATER. *s.* (*pork* and *eater*.) One who feeds on pork (*Shakspeare*).

PORKET. *s.* (from *pork*.) A young hog (*Dryden*).

PORKLING. *s.* (from *pork*.) A young pig (*Tusser*).

PORLOCK, a town in Somersetshire, with a market on Thursday, and a trade in coal and lime. It is seated on a bay of the Bristol channel, surrounded by hills, 14 miles N. by W. of Dulverton, and 170 W. of London.

POROSITY. *s.* (from *porous*.) Quality of having pores (*Bacon*).

POROUS. *a.* (*poreux*, French; from *pore*.) Having small spiracles or passages (*Milton*).

POROUSNESS. *s.* (from *porous*.) The quality of having pores; the porous part (*Digby*).

PORPHYRIUS, a famous Platonic philosopher, was born at Tyre in 233, in the reign of Alexander Severus. He was the disciple of Longinus, and became the ornament of his school at Athens; from thence he went to Rome, and attended Plotinus, with whom he lived six years. After Plotinus's death he taught philosophy at Rome with great applause, and became well skilled in polite literature, geography, astronomy, and music. He lived till the end of the third century, and died in the reign of Dioclesian. There are still extant his book on the Categories of Aristotle; a Treatise on Abstinence from Flesh; and several other pieces in Greek. He also composed a large treatise against the Christian religion, which is lost. That work was answered by Methodias, bishop of Tyre, and also by Eusebius, Apollinarius, St. Augustin, St. Jerome, St. Cyril, and Theodoret. The emperor Theodosius the Great caused Porphyry's book to be burned in 338. Those of his works that are still extant were printed at Cambridge in 1655, 8vo. with a Latin version.

"Porphyry," says Dr. Enfield, "was, it must be owned, a writer of deep erudition, and had his judgment and integrity bene equal to his learning, he would have deserved a distinguished place among the ancients. But neither the splendour of his diction, nor the variety of his reading, can atone for the credulity or the dishonesty which filled the narrative parts of his works with so many extravagant tales, or interest the judicious reader in the abstruse subtleties and mystical flights of his philosophical writings."

PORPHYRIUS. Porphyry. In mineralogy, a genus of the class earths, order aggregate. Consisting of distinct crystals of another genus imbedded in a compact hardened paste; massive, varying extremely in age, duration, hardness, and colour. This is a very extensive

tribe of earths, or rather of primitive rocks, and consists of not less than sixty-six different species, as enumerated by different mineralogists. They may be divided by the variety of substances constituting their base into the following sections.

A. Talcose: comprising three species; found in the valley Tellina, or in the Grisons; dullish green, sea-green, or silvery.

B. With a serpentine base: comprising eight species; as intermixed with quartz, garnets, mica, asbestos, iron, or feldspar. Found in the mountains of Tuscany, the Hercynian and Siberian mountains, in Hungary, Saxony, and the neighbourhood of Geneva, of various colours and hardness. Of these, one of the most useful is P. granitone, found in the mountains of Tuscany; green, with imbedded prisms of white feldspar; and sometimes a little silvery-green mica, frequently cut into mill-stones and grindstones.

C. With a base of amarus: comprising four species, as intermixed with feldspar, hornblend, mica, schorl, or garnets; all of which are found in the Swiss mountains.

D. With a calcareous base: comprising three species, as intermixed with quartz, mica, or schorl; found in Germany, Austria, or Tuscany.

E. With an argillaceous base. Seven species; as intermixed with feldspar, garnets, quartz, alumina, mica, schorl, asbestos, or chlorogranites, and often with many of these materials together. One of the most celebrated of these species is P. colarius, the clay porphyry of Thomson, the zechstein, coitenstein, mergelstein of the German oryctologists, composed of alumina and crystals of quartz, found on the banks of the Rhine, in Saxony, and various other places; with sometimes a few particles of feldspar mixed with it, which mouldering away, leaves it full of hollows.

F. With a basaltic base. Thirteen species; as imbedding trap, feldspar, schorl, quartz, hornblend, mica, wacke, calcareous spar, garnets or olivine, or various of these matters intermixed. Found in our own country, Sweden, Saxony, Bohemia, Fulda, and in the neighbourhood of Vesuvius. Of these, two species appear to have been employed by the sculptors of ancient Rome, and are now often met with among its ancient monuments: P. basalticus, consisting of basalt and feldspar, with sometimes a few particles of quartz and mica intermixed; and P. pedicularis, consisting of basalt and crystals of granatine schorl, with frequently a small mixture of hornblend, the crystals of schorl being sometimes so minute as scarcely to exceed the magnitude of the point of a needle. This division also may embrace P. anglia, turulite, or rowley-

rag, which nevertheless rather belongs to basaltes.

G. With the base of lava. Five species, as imbedding hornblend, granatine schorl, six-sided prisms of genuine schorl, mica or feldspar: Found chiefly around Vesuvius, but more or less in most volcanic countries, sometimes blending crystals of actinote, or garnet, with the other materials.

H. With the base of pitch. One species, P. piceus, pitchstone porphyry, imbedding feldspar and quartz. Found near Misena, in Saxony, forming entire mountains alternately with mountains of clay-porphry, in horizontal strata: colour black, green, brown, or red.

I. With a base of chert or hornstone. Eleven species, imbedding feldspar with a slaty or splintery texture, quartz, garnets, hornblend, mica, schorl, baryt, spar, or actinote. Found chiefly in Italy, Hungary, Bohemia, Saxony, Lusace, Switzerland, or the Tyrolese mountains. The two most worthy of notice are P. schistosus, and P. nothus; each consisting of hornstone and feldspar, the former with a slaty, the latter with a splintery texture: the first denominated horn-porphry, horn-schiefer, porphyrschiefer, found common in Bohemia, Lusace, and the bishopric of Fulda, rarely containing ores of metal; colour grey or black, and often marked with arborescent ramifications: in Italy approaching to a basalt, and melting in the fire to a yellowish glass, but not so easily as basalt; the chest of feldspar mixed in various proportions, to which is sometimes added hornblend, rarely garnets, mica, or spar, very rarely veins of marble.

The second is denominated hornstone-porphry; hornquartz-porphry; hornortiger trapp: it has sometimes a little hornblend, and sometimes a little jasper mixed with it. Found in various proportions of constituent parts and colours in the mountains of Lower Italy, Hungary, Bohemia, Saxony, Carinthia, the boundaries of the Lower Rhine, and Denmark.

K. With a base of jasper. Nine species, of which the chief is P. genuinus. Jasper porphyry. Found in Egypt, Arabia, Greece, Italy, south of France, Siberia, and most parts of Europe. Sometimes detached, sometimes forming rocks, mountains, or their principal parts; opaque, of a texture more commonly approaching to the conchoidal than the slaty, hard and admitting a fine polish, breaking into indeterminate fragments, easily melting in the fire; generally of a common form, rarely in prisms, and then always mixed with other bodies, as hornblend, mica, schorl, or quartz; infinitely varying in the colour, form, distribution, and mixture of its constituent parts; the feldspar generally white or reddish, immersed in jasper

in the form of dots, spots, stripes, or prisms, and sometimes moulder away and leaving cavities; the jasper red, brown, black, or green, rarely dull grey, or of two colours, as, black and green, red and orange. It was used by the ancients in the structure of columns, temples, and edifices of the highest orders.

Another species well worth noticing under this division is P. achates: agate; hard agate; jasper agate; striped jasper. Composed of jasper, quartz, rock-crystal, amethyst, chalcedony, cornelian and onyx, hornstone and flint, variously combined together; sometimes disposed in alternate, straight, rarely undulate bands, differing in colour: sometimes consisting of fragments angularly crustose; or with figures resembling landscapes; or in painted annulations of different colours; or with figures resembling moss; or resembling stellar dots.

Found in infinite varieties of proportion and distribution of parts, tinge of colours, hardness and lustre in Britain, Ceylon, and most parts of Europe, sometimes detached, sometimes imbedded in clay, rarely in veins or a stalactitical form, and is used for rings, ornaments, and decorations of nobler edifices.

PORPOISE, in mastiology. See DELPHINUS.

PORRA'CEOUS. *a.* (*porraceus*, Latin; *porrace*, French.) Greenish (*Wiseman*).

PORRE'CTION. *s.* (*porrectio*, Lat.) The act of reaching forth.

PO'RRET. *s.* (*porrum*, Latin.) A scallion.

PO'RRIDGE. *s.* (more properly *porrage*; *porrata*, low Latin, from *porrum*, a leek.) Food made by boiling meat in water; broth.

PO'RRIDGEPOT. *s.* (*porridge* and *pot*.) The pot in which meat is boiled for a family.

PORRIGO. (*porrigendo*, from its spreading abroad.) A disease very common among children, in which the skin of the hairy part of the head becomes dry and callous, and comes off like bran upon combing the head.

PO'RRINGER. *s.* (from *porridge*.) 1. A vessel in which broth is eaten (*Bacon*). 2. It seems in *Shakspeare's* time to have been a word of contempt for a headress.

PORRUM. The common leek. *Allium porrum* of Linnéus. Every part of this plant, but more particularly the root, abounds with a peculiar odour. The expressed juice possesses diuretic qualities, and is given in the cure of dropsical diseases, and calculous complaints.

PORSELOU, a rich and commercial town of the kingdom of Siam. It is surrounded with fourteen bastions, and situate on a large river, 300 miles N. of its mouth in the gulf of Siam. Lon. 100. 2 E. Lat. 17. 48 N.

PORSON (Richard), a very eminent Greek scholar, was born at East Ruston, in Norfolk, on Christmas-day, 1759. Every thing about this most eminent scholar, and particularly the circumstances which laid the foundation of that most inestimable memory, by which he was enabled to store his mind with all the

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riches of literature, ancient and modern, will become truly interesting to the world. He owed the blessing to the care and judgment of his father, Mr. Huggin Porson, who was parish-clerk of East Ruston, and who, though in humble life, and without the advantages himself of early education, laid the basis of his son's unparalleled acquirements. From the earliest dawn of intellect Mr. Porson began the task of fixing the attention of his children, three sons and a daughter; and he had taught Richard, his eldest son, all the common rules of arithmetic, without the use of a book or slate, pen or pencil, up to the cube root, before he was nine years of age. The memory was thus incessantly exercised; and by this early habit of working a question in arithmetic by the mind only, he acquired such a talent of close and intense thinking, and such a power of arranging every operation that occupied his thought, as in process of time to render the most difficult problems, which to other men required the assistance of written figures, easy to the retentive faculties of his memory. He was initiated in letters by a process equally efficacious. His father taught him to read and write at one and the same time. He drew the form of the letter either with chalk on a board, or with the finger in sand; and Richard was made at once to understand and imitate the impression. As soon as he could speak he could trace the letters; and this exercise delighting his fancy, an ardour of imitating whatever was put before him was excited to such a degree, that the walls of the house were covered with characters which attracted notice from their neatness and fidelity of delineation.

At nine years of age, he and his youngest brother, Thomas, were sent to the village-school, kept by a Mr. Summers. He professed nothing beyond English, writing, and arithmetic, with the rudiments of Latin: he was a good accountant and an excellent writing-master. He perfected the professor in that delightful talent of writing, in which he so peculiarly excelled; but which we are doubtful whether it was to be considered as an advantage or a detriment to him in his progress through life. It has been the means, however, of enriching his library with annotations, in a text the most beautiful, and with such perfect imitation of the original manuscript or printing, as to embellish every work which his erudition enabled him to elucidate. He continued under Mr. Summers for three years; and every evening during that time he had to repeat by heart to his father the lessons and tasks of the day; and this not in a loose or desultory manner, but in the rigorous order in which whatever he had been occupied about had been done; and thus again the process of recollection was cherished and strengthened, so as to become a quality of his mind. It was impossible that such a youth should remain unnoticed, even in a place so thinly peopled, and so obscure as the parish of East Ruston. The reverend Mr. Hewitt heard of his extraor-

dinary propensities to study, his gift of attention to whatever was taught him, and the wonderful fidelity with which he retained whatever he had acquired. He took him and his brother Thomas under his care, and instructed them in the classics. The progress of both was great, but that of Richard was most extraordinary. It became the topic of astonishment beyond the district, and when he had reached his fourteenth year, had engaged the notice of all the gentlemen in the vicinity. Among others, he was mentioned as a prodigy to an opulent and liberal man, the late Mr. Norris, who after having put the youth under an examination of the severest kind, and from which an ordinary boy would have shrunk dismayed, sent him to Eton. This happened in the month of August, 1774, when he was in his 15th year; and in that great seminary, he, almost from the commencement of his career, displayed such a superiority of intellect, such facility of acquirement, such quickness of perception, and such a talent of bringing forward to his purpose all that he had ever read, that the upper boys took him into their society, and promoted the cultivation of his mind by their lessons, as well, probably, as by imposing upon him the performance of their own exercises. He was courted by them as the never-failing resource in every difficulty; and in all the playful excursions of the imagination, in their frolics as well as in their serious tasks, Porson was the constant adviser and support.

The death of Mr. Norris was the source of severe mortification to him; for though by the kindness of some eminent and liberal persons he was continued at Eton, he felt the loss he had sustained in the most poignant degree. But we cannot now do more than trace the dates of his progress to the professor's chair. He was entered of Trinity college towards the end of 1777, and his character having gone before him to the university, he was from the first regarded as a youth whose extraordinary endowments would keep up and extend the reputation of the unrivalled society into which he had entered. Nor did he disappoint the hopes that had been formed of him. In every branch of study to which he applied himself, his course was so rapid as to astonish every competent observer. By accidents he was drawn first to read in mathematics, in which, from his early exercises, he was so eminently calculated to shine, but from which he drew no benefit; and then by the prospect of a scholarship, which, however, did not become vacant till long after, he sat down to the classics. In this pursuit he soon acquired undisputed pre-eminence. He got the medal of course, and was elected a fellow in 1781. In 1785 he took his degree of master of arts; but long before the period had elapsed when he must either enter into holy orders or surrender his fellowship, he had (after the most grave and deliberate investigation, to which he had brought all that acute gift of examination that has been made so perceptible in his letters to Mr. archdeacon Travis) made up his mind on the sub-

ject of subscription. So early as 1788, he had determined to surrender his fellowship, though with an enfeebled constitution he had nothing to depend upon but acquisitions that are very unprofitable to their owner. A lay-fellowship, to be sure, might have secured his services to the cause of letters; but the disingenuous conduct of an individual withheld from him that resource. In 1791 his fellowship ceased, and he was thrown upon the world without a profession, his feelings wounded by the mortifications he had suffered, and with a constitution little qualified to encounter the bustle of the world. Some private friends, however, stepped in, and soon after he was elected Greek professor at Cambridge by an unanimous vote of the seven electors. The distinction of this appointment was grateful to him. The salary is but 40*l.* a year. It was his earnest wish, however, to have made it an active and efficient office, and it was his determination to give an annual course of lectures in the college, if rooms had been assigned him for the purpose. These lectures, as he designed, and had in truth made preparations for them, would have been invaluable; for he would have found occasion to elucidate the languages in general, and to have displayed their relations, their differences, their near and remote connections, their changes, their structure, their principles of etymology, and their causes of corruption. If any one man was qualified for this gigantic task, it was Mr. professor Porson; and if his wishes had not been counteracted, we know that he would have undertaken the labour.

From this time, instead of lectures, he turned his thoughts to publication. His letters to Mr. archdeacon Travis, as has been truly said, put the controversy on the disputed text to rest; and indeed it was the peculiar felicity of his mind, that whatever he undertook to elucidate he fixed for ever in the light.

In 1795 he married Mrs. Lunan, the sister of Mr. Perry, editor of the *Morning Chronicle*, but who sunk under a decline in 1797, and from that time the professor himself was so incessantly afflicted with a spasmodic asthma, as to interrupt him in every study to which he applied himself. Whether his sedentary habits served to bring it on we know not, but certainly very few men had accustomed themselves to such patient and continued toil. He had undertaken to make out and copy the almost obliterated manuscript of the invaluable lexicon of Photius, which he had borrowed from the library of Trinity college. And this he had with unparalleled difficulty just completed, when the beautiful copy which had cost him ten months of incessant toil, was burnt in the house of Mr. Perry at Merton. The original being an unique, entrusted to him by his college, he carried with him wherever he went; and he was fortunately absent from Merton on the morning of the fire. Unruffled by the loss, he sat down without a murmur, and made a second copy as beautiful as the first. It is extant in his library, and is quite ready for the press. Of the plays of Euripides, which he

published, the learned world has pronounced its judgment. Besides these he has left an *Orestes* quite ready for the press.

On the establishment of the London Institution, the managers manifested their own discernment and love of letters by selecting him to be their principal librarian, an appointment for which he was peculiarly qualified, and by which, if time and health had been allowed him, he would have made their library truly valuable. But he was seized with an intermittent fever early in September, 1808, for which, as he had an unfortunate objection to medical advice, he resorted to his usual remedy of abstinence; but on Monday the 19th, he suffered an apoplectic stroke, from which he recovered only to endure a second attack the next day. He languished to the Sunday night, and expired without a struggle, in the 49th year of his age.

The principal qualities in this great man's mind were his extraordinary acuteness of discernment and solidity of judgment; and these, added to his intense application and stupendous memory, made him, what the world perhaps never saw before, a complete critic, in the most honourable and extended sense of that appellation. His reading was of course immense; he was an excellent French scholar; but in his native language, in the Latin, and in the Greek, he was most familiarly and profoundly versed. He had indeed applied the knowledge he had gained of the origin and structure of language in general to all these dialects (if we may so express ourselves) of the universal language; and, had not his eminence in classical literature, by its uncommon lustre, obscured other attainments, he would doubtless have been considered as one of the first English scholars. In Greek, however, we have no hesitation in pronouncing him the very first, not merely of his own age, but of every other. He is surely entitled to this honourable distinction, when we consider that he possessed at once, each in its highest degree of excellence, all the qualities for which any single scholar has hitherto been eminent. In him were conspicuous boundless extent of reading; a most exact and well ordered memory; unwearied patience in unravelling the sense of an author, and exploring the perplexities of a manuscript; perspicacity in discovering the corruptions of a text; and acuteness, almost intuitive, in restoring the true reading. All this, be it observed, was tempered with a judgment which preserved him invariably from the rocks against which even the greatest of his critical predecessors have at some time or other split; we mean precipitation in determining that to be unsound, which after all had no defect; and rashness in applying remedies which only served to increase the disease.

PORT, a commodious place situated on the sea-coast, or at the mouth of a river, screened from the wind and the enterprizes of an enemy, with depth of water sufficient for ships of burden, and where vessels lie by to load and unload.

Ports are either natural or artificial; the

natural are those formed by Providence, and the artificial such as are formed with moles running into the sea. The city of Constantinople is called the Port, from its having one of the finest ports in Europe. All the ports and havens in England are within the jurisdiction of the county; and the court of admiralty cannot hold jurisdiction of any thing done in them. 30 Henry VI.

PORT HOLES, in a ship, are the holes in the sides of the vessel through which are put the muzzles of the great guns. These are shut up in storms to prevent the water from driving through them. The English, Dutch, and French ships, have the valves or casements fastened at the top of the port holes, and the Spanish vessels aside of them.

PORT, signifies also a gate. And is often used to denote the carriage; air; mien; manner; bearing.

PORT, is also a strong wine brought from Port-a-port, and also called Porto and Oporto.

PORT OF THE VOICE, in music, the faculty or habit of making the shakes, passages, and diminutions, in which the beauty of a song or piece of music consists.

To PORT. v. a. (porto, Lat. porter, Fr.) To carry in form.

PORT-CRAYON, a pencil-case, which is usually four or five inches long, and contrived so that the pencil may slide up and down. Its inside is round, and its outside is sometimes filed into eight sides or faces, on which are drawn the sector-lines; sometimes it is made round both without-side and within, and has its length divided into inches, and parts of inches.

PORT-FIRE, a composition for setting fire to powder, &c. Port-fires are frequently used by the artillery in preference to matches; and they are distinguished into wet and dry port-fires. The composition of the former is saltpetre four, sulphur one, and mealed powder four. When these materials are thoroughly mixed and sifted, the whole is to be moistened with a little linseed oil, and rubbed between the hands till all the oil is imbibed by the composition. The preparation for dry port-fires is saltpetre four, sulphur one, mealed powder two, and antimony one. These compositions are driven into small paper cases, to be used whenever necessary. See **MATCH**.

PORT DESIRE, a harbour on the E. coast of Patagonia, where ships sometimes touch in their passage to the Pacific ocean. Lon. 67. 56 W. Lat. 47. 50 S.

PORT EGMONT, one of the finest harbours in the world, on the N.W. coast of Falkland Islands, discovered by commodore Byron in 1765. The whole navy of England might ride here in perfect security from all winds; and every thing for the refreshment of ships is to be obtained here in abundance. Lon. 55. 0 W. Lat. 51. 27 S.

PORT JACKSON, a large bay on the coast of New South Wales, three leagues and a half N. of Cape Banks. The capes that form its entrance are high, rugged, and perpendicular

cliffs. On proceeding within, in 1788, governor Philip discovered a large branch extending to the south, and found himself perfectly landlocked, with a good depth of water; and finding also, that the country was greatly superior to that round Botany Bay, he determined to fix the colony of convicts here, which had been originally intended for Botany Bay. The name of Port Jackson had been given to it by captain Cook, as he observed it in sailing along the coast. Lon. 151. 28 E. Lat. 33. 50 S.

PORT L'ORIENT. See **ORIENT**.

PORT LOUIS, a strong town of France, in the department of Morbihan, with a citadel, and a good harbour. It is a station for part of the French navy, and the East India company's ships; and is seated at the mouth of the Blanet, 27 miles W. of Vannes. Lon. 3. 18 W. Lat. 47. 40 N.

PORT LOUIS, a French fortress, on the S.W. coast of Hispaniola, demolished by admiral Knowles in 1747, but since rebuilt. Lon. 73. 16 W. Lat. 18. 18 N.

PORT LOUIS, a town and harbour of the Isle of France, in the Indian Ocean, strongly fortified. Lon. 57. 28 E. Lat. 20. 9 S.

PORT MAHON. See **MINORCA**.

PORT PAIX, a town on the north coast of St. Domingo, in the West Indies, with a good harbour. Lon. 72. 55 W. Lat. 19. 58 N.

PORT PATRICK, a seaport in Wigtonshire, confined by the sea on one side, and on the other by over-hanging rocks and hills. It is noted for its ferry to Donaghadee in Ireland, from which it is only 20 miles distant; and a packet-boat sails from hence for that place every day. The harbour is good; and has one of the finest quays in Great Britain, with a reflecting lighthouse. It is 107 miles S.W. of Edinburgh, and 487 N.W. of London.

PORT ROSEWAY. See **SHELBOURNE**.

PORT ROYAL, a seaport of Jamaica, once one of the finest towns in America, abounding in riches and trade. In 1692, it was destroyed by an earthquake, in 1702 by a fire, in 1722 by an inundation of the sea, and in 1744 it suffered greatly by a hurricane. It still consists of three handsome streets, built on a small neck of land which juts out several miles into the sea, and is guarded by a strong fort. The harbour is one of the best in the world, and 1000 ships may ride therein, secure from every wind. It is six miles E. of Spanish Town, and as much by water S.E. of Kingston. Lon. 76. 45 W. Lat. 18. 0 N.

PORT ROYAL, a town and fort of the island of Martinico, 21 miles S.E. of St. Pierre. Lon. 61. 9 W. Lat. 14. 3 N.

PORT ROYAL, a town of the United States, in Virginia, on the river Rappahannoc.

PORT ROYAL, an island on the coast of South Carolina, the space between which and the neighbouring continent forms one of the most commodious harbours in those parts. It is 15 miles in length, and the town on the N. shore, called Beaufort, is 100 miles S.W. of

Charleston. Lon. 80. 10 W. Lat. 31. 40 N.

PORT ROYAL, in Nova Scotia. See AN-NAPOLIS.

PORT ST. ANN. See KILLOUGH.

PORT ST. JULIAN, a harbour on the coast of Patagonia, where ships usually touch that are bound for the Pacific Ocean. Lon. 68. 44 W. Lat. 49. 10 S.

PORT ST. MARY, a seaport of Spain, in Andalusia. The English made a descent here in 1702, with a design to besiege Cadiz, but without success. It is 10 miles N.E. of Cadiz. Lon. 6. 0 W. Lat. 35. 37 N.

PORT SANDWICH, a harbour in the island of Mallicolo, in the S. Pacific Ocean. Lon. 167. 53 E. Lat. 16. 25 S.

PORT VENDRE, a seaport of France, in the department of the Eastern Pyrenees and late province of Rousillon. It was taken by the Spaniards in 1793, but retaken the next year. It is 25 miles S. by E. of Perpignan.

PORTA. (*porta*, a *portando*, because through it the blood is carried to the liver.) That part of the liver where its vessels enter.

PORTÆ VENA. See VENA PORTÆ.

PORTA (Joseph), of Castel Nuovo, acquired celebrity by his pieces in oil and in fresco. He wrote also some mathematical treatises, and died at Venice 1585, aged 50.

PORTA (John Baptist), a Neapolitan, eminent for his learning. As he admitted a society of learned friends into his house, he was accused of magical incantations, and exposed to the censures of Rome. He died 1515, aged 70. He invented the camera obscura, improved afterwards by Gravesande, and formed the plan of an encyclopedia. He wrote a Latin treatise on natural magic, 8vo.; another on physiognomy, mixed with astrology, &c.; *de occultis literarum notis*; *physiognomica*, folio, &c.

PORTA (Simon), or PORTIUS, a Neapolitan, distinguished by his learning, and professor of philosophy at Pisa. He died at Naples 1554, aged 57. He is author of treatises *de mente humanâ—de voluptate et dolore—de coloribus oculorum*, 4to.—*de rerum naturalium principiis libri duo—opus physiologicum*, 4to, &c.

PORTABLE. *a.* (*portabilis*, Latin.) 1. Manageable by the hand. 2. Such as may be born along with one (*South*). 3. Such as is transported or carried from one place to another (*Locke*). 4. Sufferable; supportable.

PORTABLENESS. *s.* (from *portable*.) The quality of being portable.

PORTADOWN, a town of Ireland, in the county of Armagh, with an extensive linen manufacture. It is situate on the river Bann, nine miles N.E. of Armagh, and 16 N. of Newry.

PORTAGE. *s.* (*portage*, French.) 1. The price of carriage (*Fell*). 2. (from *port*.) Porthole (*Shakspeare*).

PORTAL. *s.* (*portail*, French.) A gate; the arch under which the gate opens (*Sandys*).

PORTALEGRE, a strong town of Portugal, in Alentejo, with a bishop's see. It is seated at the foot of a high mountain, in a pleasant country, 30 miles N.W. of Elvas, and 90 N. E. of Lisbon.

PORTANCE. *s.* (from *porter*, Fr.) Airy mien; port; demeanour (*Spenser*).

PORTASS. *s.* (sometimes called *portuis*.) A breviary; a prayer-book (*Camden*).

PORTARLINGTON, a borough of Ireland, partly in King's and partly in Queen's county. It is seated on the river Barrow, 31 miles N. of Kilkenny, and 36 S.W. of Dublin.

PORTCULLICE, in fortification, is an assemblage of several large pieces of wood, joined across one another like a harrow, and each pointed with iron at the bottom. They are sometimes hung over the gateway of old fortified towns, ready to let down in case of surprise, when the gates could not be shut.

To PORTE'ND. *v. a.* (*portendo*, Lat.) To foretoken; to foreshow as omens (*Roscommon*).

PORTE'NSION. *s.* (from *portend*.) The act of foretokening: not in use (*Brown*).

PORTE'NT *s.* (*portentum*, Latin.) Omen of ill; prodigy foretokening misery (*Dryden*).

PORTE'NTOUS. *a.* (*portentosus*, Latin.) 1. Foretokening ill; ominous (*Shakspeare*). 2. Monstrous; prodigious; wonderful (*Roscommon*).

PORTER. *s.* (*portier*, French; from *porta*, Latin, a gate.) 1. One that has the charge of the gate (*Arbutnot*). 2. One who waits at the door to receive messages (*Pope*). 3. (*porteur*, French.) One who carries burdens for hire (*Howel*).

PORTER. A malt liquor of a deep brown colour and a peculiar flavour, which it derives from the malt used in brewing, it being highly dried in the malt-kilns. This, at least, was the composition of porter until lately, when it has been found that the same colour and flavour may be communicated to liquor brewed from a mixture of brown and pale malt, by the addition of certain colouring matters, which being obtained from burning the same substance that causes the brown colour of the highly dried malt, produces a similar liquor at a far less expence of materials than when brown malt alone is used; because the pale malt yields a far greater proportion of saccharine matter than the brown, in which a share of the saccharum is burnt up in the kiln only for the purpose of producing a colour and flavour which may so easily be communicated to the beer of pale malt by a small quantity of burnt sugar.

The art of brewing porter is referable to the same general principles as any other beer. (See BREWING.) What we chiefly intend to explain in this article is the admirable system of management under which the process is conducted in the great porter breweries in London, some of which are on such an ex-

PORTER.

tensive scale as to brew 100,000 barrels annually in one house.

The process of brewing porter as generally practised with but trifling variations in these works is as follows. The different kinds of malt made use of are pale, brown, and amber, which is a medium between the two. Some brewers use equal quantities of the three; others equal proportions of pale and brown; others use amber malt alone; and some pale malt with one-third of brown. These varieties give to their porter the different flavours for which they are distinguished by the connoisseurs in this liquor.

The malt being coarsely ground, or in some breweries bruised between iron rollers, is deposited in the mash tun, into which water is admitted, heated to 150 degrees of Fahrenheit (when the malt is compounded of the three kinds) for the first mashing; and in quantity at the rate of two barrels per quarter of malt. It is next mashed and mixed up by the mashing engine about three-quarters of an hour; then it stands to extract the saccharum of the malt for an hour, at the end of which the wort, called the first wort, is run off into the under back. In a large mash tun it will take half an hour to run off, and is immediately pumped up into the copper to be boiled. At about an hour and three-quarters, or two hours, from the commencement, the water for the second mash is admitted into the mash tun at a heat of 160 degrees, but only one barrel to the quarter of malt, because the malt is already wetted from the first liquor. It is mashed by the engine for half an hour, and stands an hour; after which it is run off. During this time the first wort has been boiling in the copper, where the hops are put to it, usually at the rate of six or seven pounds to the quarter of malt, which makes three barrels and a half of porter; but this quantity is increased or diminished as the liquor is intended for keeping, or for a quick consumption. After boiling the proper time (the length of which is much disputed, and greatly varied by different brewers) the wort is run off into the coolers. The third mash is made at about two hours and a half after beginning the second mash; it is heated to 180 degrees, and at the rate of one barrel one firkin per quarter: it is mashed half an hour, and stands one hour, as the other mashes; before it is run off. A fourth mash is sometimes made, but it is only taken at a blood heat and sufficient quantity to cover the malt, upon which it stands two hours; it is used to make sour beer for the finings, as will be hereafter explained, though some brewers boil it again the next morning for the first mash instead of fresh water. This practice, however, is not a good one, because the wort by standing all night frequently becomes *foxed*; a term used by the brewers to denote a premature fermentation of the wort before the gross mucilaginous parts of the extract are coagulated by the process of boiling. The first wort being richer than the others soon contracts the fox, particularly in hot weather, if it is left in the

under back, and therefore it is pumped up into the copper as soon as the water which was heated in the copper for the second mash can be run out into the mash tun. The weaker worts may stand much longer without danger of foxing; and therefore the fourth wort when taken may in cold weather stand all night, and be good the next morning to use instead of fresh water; in which case a considerable saving of malt will be made, or the liquor be stronger: but if, on the other hand, it becomes tainted, a whole brewing of beer may be spoiled by it. On this account the most established brewers rather choose to lose the advantage than take the risk, and therefore make only three mashes.

The boiling of the wort coagulates the mucilage suspended in the liquor, and separates it into distinct fecula, which, when it is run into the coolers, deposit themselves in considerable quantities. By this means it is freed from the superabundant portion of gross fermentable matter, which would otherwise occasion the beer to proceed so rapidly through the process of fermentation, that those gross parts would come to the acetous, and even the putrefactive, fermentation before the other parts of the beer had advanced sufficiently in the vinous fermentation to give the liquor its proper strength. The addition of the hops which is made in the boiling also tends to the same effect, of retarding the fermentative disposition; and for this reason the proportion of hops must be regulated by the time the beer is intended to be kept. If it is intended for exportation it must have a large quantity of hops; and then it will be kept long enough to fine itself, at least in a great degree, by the gradual subsidence of the minute fecula suspended in it. But the porter brewed for the supply of London is kept a very short time, and therefore has a small share of hops; and as it would not have time to become fine, it is fined by a peculiar process on purpose.

The different worts after boiling are spread out thin in the coolers, and their temperature brought down to between 60 and 70 degrees, at which all the three worts are mixed together in a great vessel called the guile tun or square, where yeast being put to it the liquor is fermented. The temperature at which the wort is set to working in the square, and the heat at which the several mashes are made, have greater influence than any other circumstances upon the quality of the beer. The greater the working heat is, the more rapidly the fermentation proceeds: therefore in summer, when the natural heat of the air is such that the working will advance perhaps more rapidly than the brewer wishes, he counteracts this by cooling the wort down as low as possible: on the other hand, in cold weather the fermentation must be encouraged by commencing it at a greater temperature; in general it may be stated to be between 60 and 70 degrees, at the discretion of the brewer, and in some degree regulated by the kind of porter he wishes to produce, and the malt from which he has

extracted his wort. The fermentation is continued in the square as long as the head of yeast which floats upon it continues to increase in depth; but when the head shews signs of diminution the liquor is fit for cleansing. This is putting it into a great number of small casks, which, by dividing the beer into small quantities, lowers its temperature and tends to check the fermentation. The same end is also attained by causing the yeast to flow off as fast as it is produced, and keeping the casks always filled up as they diminish by working, to leave no room for a head of yeast to gather upon the surface of the beer. After the fermentation is concluded the beer is put into immense casks called store vats, where it is kept till wanted for sale. By keeping it begins to clear itself, and grow fine; but it is seldom kept long enough to become perfectly so. It is when wanted drawn off from the store vats into casks, and then sent away; and the consumer puts into the cask a small quantity of *fining*, sent out with the porter by the brewer, who calls it *in the rough* when his liquor requires fining.

The finings are made of isinglass dissolved in sour beer brewed from the wort of the fourth mash, or sour beer obtained from the waste of any of the processes. A small quantity of this fining beer being put into the cask precipitates the minute scum, and soon renders the liquor quite fine. The flavour of the draught porter in London is almost universally obtained by compounding two kinds, the due admixture of which is palatable, though neither are good alone. One is mild, and the other stale porter; the former is that which has been lately brewed, and has rather a bitter mawkish flavour; the latter has been kept longer, and is in some degree acid. This mixture the publican adapts to the taste of his several customers; he effects the proportion of mixture very readily by means of the BEER PUMPS, described under that article (see pl. 24). These will be found to have four pumps, but only three spouts, because two of the pumps throw out at the same spout. One of these two pumps draws mild, and the other the stale porter; and the publican, by dextrously changing his hold to the next handle works, either pump, and draws both kinds of beer at the same spout; and an indifferent observer supposes that since it all comes from one spout it is entire butt beer, as the publican professes over his door, and which vulgar prejudice has decided to be the only good porter, though the difference is not easily distinguished.

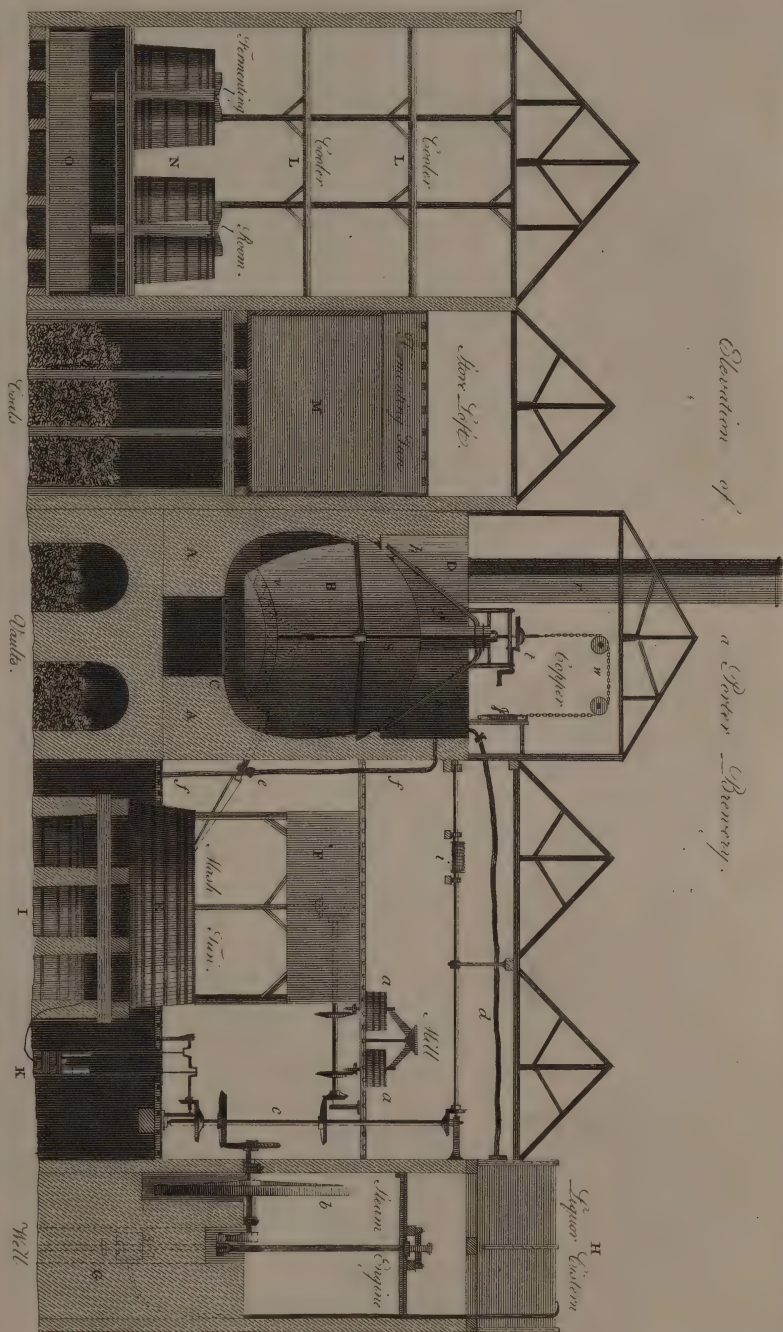
A walk through an extensive London porter brewery, as Mr. Whitbread's, Meux's, Barclay's, or many others, is very interesting, by reason of the very extensive scale on which their processes are conducted, by the aid of the steam engine, which is applied to perform all the laborious operations without exertion of the workmen, who are very few in number considering the magnitude of the works.

Plate 140 contains an elevation of a porter brewery, shewing all the vessels and machinery at one view. This elevation is in some

measure imaginary, as few works have their vessels so arranged as to be all seen at once; being often situated one behind the other as the local convenience of the building demands. AA represents the walls supporting the copper B, and containing the fire-place at C with the fire grate, and chimney *r*. Above the copper is a vessel D, called the copper-pan, in which the liquor is heated previously to being let down into the copper. E is the mash-tun containing the mashing machine, of which we have given a detail in plate 141. Over this is a bin F to contain the malt, after it has been ground in the millstones, *aa*. These are turned by wheel-work from the steam-engine, of which *b* is the fly-wheel: this, by bevelled cog-wheels on its axis, turns a vertical shaft *c*, upon which are other bevelled wheels giving motion to the rest of the machinery. The beam of the steam-engine works a pump down in the well G, by which cold water is raised up to a large cistern H, supported on the walls of the engine house. From this cistern a pipe *d* proceeds to the copper where the water is heated, and is then let out at the cock *e* into the mash-tun, previously filled with ground malt, let down from the bin F. When sufficiently mashed, the wort is let down into a vessel I beneath the mash-tun, called the underback, from which it is drawn by the pumps K, and conducted by the pipe *ff* up to the copper-pan D. In this pan it derives considerable heat from the copper when any liquor is boiling beneath, as the steam rising from it cannot escape, because the copper is covered with a dome-head; it therefore ascends through the large-central pipe *g*, and turning down the inclined pipes *h, h*, bubbles out beneath the surface of the liquor contained in the pan D, and by this means communicates a very considerable heat to it, which, as well as what comes up through the dome of the copper, would otherwise be lost. When the water in the copper is let out into the mash-tun to make the second mash, the wort is let down from the copper-pan into the copper to be boiled; and the hops are put in at a door in one side of the dome covering the copper, the pan D being notched in on that side to give access to it. The hops are kept stirring all the time the boiling is continued, to prevent their burning to the bottom of the copper. It is done by a vertical spindle *s*, in the centre of the copper, which is put in motion by cog wheels at *t*, turned by hand, or sometimes by the engine. At the lower end of the spindle a cross bar *v* is fastened, and to this chains are linked, which drag round upon the bottom of the copper when the wheels are turned. This machine is called the *rouser*: it can be drawn up out of the way when the copper requires cleaning, by a chain *w* passing over pulleys, and drawn by proper rollers.

After boiling, the worts and hops together are run out at the cock *e*, and conducted by a spout into a large vessel called the jack-back (which being before the copper cannot be shewn in our late): it has a false bottom &

Elevation of
a Porter Brewery.



Facey, del.

Mudlow, sc. Rayfield Col.

Fig. 1.

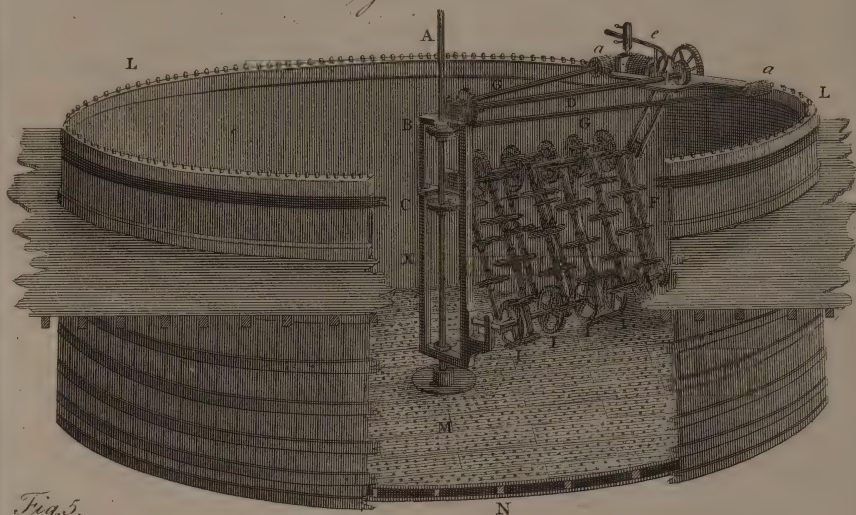


Fig. 2.

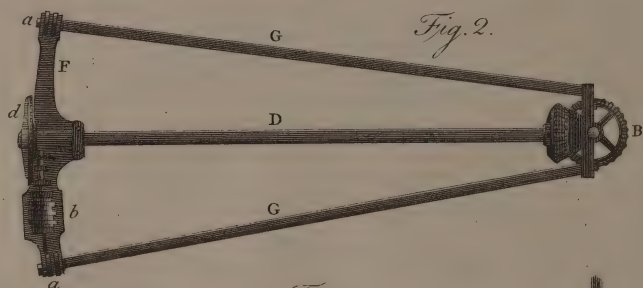


Fig. 3.

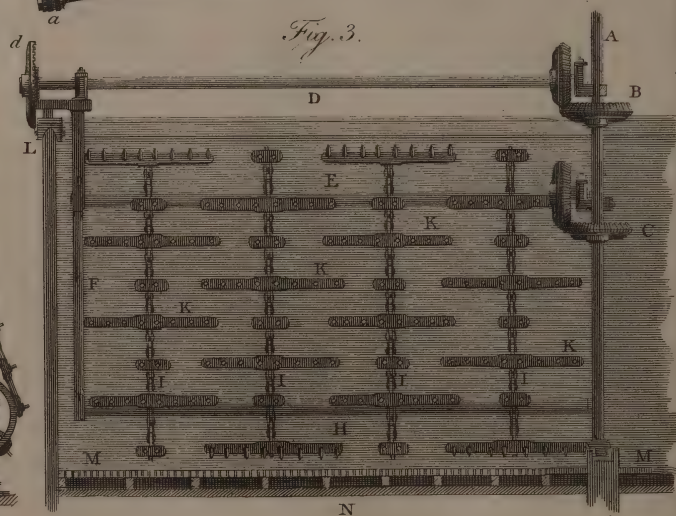


Fig. 4.

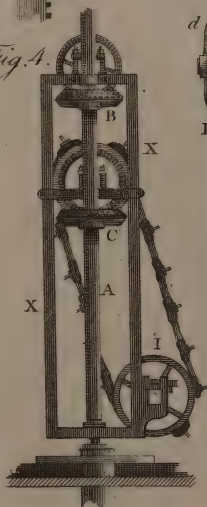
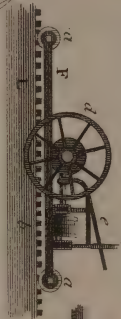


Fig. 5.



P O R T E R.

few inches above the real bottom, pierced with a great number of small holes to retain the hops, but allow the wort to run off, when it is drawn by the pumps K, and thrown up through pipes into any one of the coolers at L L. These latter are large shallow backs, where the liquor remains till cooled to the proper temperature, and is then let down into a large vessel M, called the *square*. In this yeast is put to it, and it is fermented for a certain time. The second wort passes through exactly the same vessels as the first, and when it comes to the copper to be boiled, the hops are drawn up in baskets from the jack-back (by a rope winding round the roller *i* turned by the engine), and put into the copper to be boiled again; and after this the second wort follows the first wort through the same kind of vessels, and is mixed with it in the square M. The malt is drawn up to the mill in sacks by the same or a similar roller, as *i*, and deposited in large bins (which cannot be seen in the plate), where it is kept till wanted, and is then brought to the mill *aa*.

After the beer has been fermented the proper time in the squares, it is run off with the yeast by proper pipes into a great number of small tuns at N, called the *rounds*. In these the fermentation is completed, the yeast running off as fast as it is produced through spouts *l*, into a large vessel O beneath. When the fermentation is concluded, the beer is drawn off and pumped by a pump similar to that at K (but farther from the engine) into very capacious tuns, usually situated in another building, and therefore omitted in the plate. They are indeed of enormous capacity, some containing as much as 5000 barrels, being 40 feet in diameter. In these it is kept till wanted for sale, when it is drawn off into small casks, and sent away from the brewery.

Plate 141 contains drawings of a mashing machine made by Mr. Cooper of Old-street, London. Fig. 1 is a perspective view of the mash-tun, with a part of its staves removed to expose the machine within it. Fig. 2 is a plan; fig. 3 an elevation; fig. 4 an end view of the machine; and fig. 5 is an end view of fig. 2. A is a vertical shaft, turned round by the engine. It has two bevelled cog-wheels upon it, at B and C, which turn two others upon horizontal shafts D and E. These are supported in a framing of cast iron, consisting of two pieces; one surrounding the vertical shaft, as shewn at X, in figs. 1 and 4, and the other marked F, is supported upon small wheels *aa*, figs. 2 and 5, which run upon the edge of the tun. These frames are united by the rods GG, fig. 2. The framing also supports a horizontal shaft H near the bottom of the tun. It has four wheels I upon it, and the uppershaft E has four others corresponding with it. From each of these wheels to its fellow an endless chain is extended, and upon the links of these, cross pieces K, called *rakes*, are fixed, having a number of pegs driven through them, as is shewn in figs. 1, 3, and 4. By the motion of the vertical axis the others are turned

round, and the chains revolve with their rakes, which descend through the malt to the bottom of the tun, and then rise up again; by this means agitating it most effectually. At the same time that this motion is going on, the whole machine revolves round in the tun, so as to constantly operate upon a fresh part of the materials. This motion is effected by an endless screw at *b*, in the frame F, figs. 2 and 5, which runs upon the edge of the tun. This endless screw has a pinion on its axis turned about by the wheel *d*, on the end of the horizontal shaft D. The thread or spiral of the screw is engaged with a ring of cogs fixed all round in the edge of the tun at LL; and by this means the whole machine is slowly advanced round the tun as the screw revolves. The wheel *d* has two rings of teeth upon it of different diameters, and both of these work in pinions on the axis of the screw, therefore turning them with different velocities. Now one or other of these pinions being locked in gear by the lever *e*, will cause the screw to revolve with a greater or less velocity, in proportion to the different sizes of the above-mentioned rings of cogs on the wheel *d*.—The mash-tun is filled up with a false bottom MM, leaving a space of one or two inches between it and the real bottom N. The false bottom is pierced with a great number of small holes, through which the wort percolates when drawn off, leaving the malt above lying on the false bottom.

The reader is now acquainted with the arrangement of the several vessels and the principal machinery employed in a brewery: the following is, with little variation, the routine of daily business. They begin very early in the morning, as one or two o'clock, to light the copper and steam-engine fires, the copper and the pan over it having been filled with water (called liquor) from the liquor-back the preceding evening, and the back filled up again by the liquor pump attached to the steam-engine; and at the same time the malt was let down from the bin into the mash-tun, during which time the space between the bin and the tun was enclosed with curtains, to prevent any loss of malt by the dust. When the liquor (water) is properly heated, the fire under the copper is damped by opening the fire door, and the liquor is run off at the cock *e* into the mash-tun. It is conducted by a pipe into the space between the true and false bottoms of the tun, and rises up through the malt lying upon the latter immediately or even before the first liquor quits the copper, that contained in the pan over the copper is let down (rather warmed by the heat rising from the copper) to supply its place, and prevent the bottom of the copper from burning, as it would do in a short time if left empty. The copper-pan is filled up again from the liquor-back, and the fire made up to heat this liquor to make the 2d mash. When the first liquor is run into the mash-tun, the mashing engine is put in motion by the engine to agitate and stir up the malt, that every part may be thoroughly mixed and subjected equal-

ly to the action of the water. This continues three-quarters of an hour, and then the machine is stopped, the mash stands still to extract for an hour, and the wort is then let down by a large cock in the bottom into the under-back beneath. It will take a long time to drain off from the malt; and by that time the 2d liquor is sufficiently heated in the copper to be admitted to the mash-tun to make the 2d mash. As soon as the cock of the copper is opened, the fire is damped by opening the fire-door, and the engine is set to work to pump up a small quantity of the first wort by the pump K from the under-back, into a small back at the top of the house (not seen in the plate, being before the copper) into which the pipe *f* delivers. The contents of this back are let down the instant the copper is empty, to preserve the bottom from burning, and the pump continues to work till the whole of the wort is got into the copper. The hops are now drawn up in bags to the copper head by the tackle I, and their seams being ripped open the contents are thrown into the copper at the man-hole, or door, in the crown of it. This man-hole is closed by an iron lid, fitting steam-tight, and fastened by screws to keep it shut close and retain the steam. The fire beneath the copper is then urged very strongly to boil the first wort, and the steam rising up from it bubbles up through the liquor (water) in the pan, so as to heat that also. The rowser is all this time at work to prevent the hops burning to the copper bottom. During the boiling the second mash has been going on, and when completed, the second wort is run off into the under-back; and as soon as the boiling is completed the fire is damped, and the wort, together with the hops, are run into the jack-back (not shewn in the plate). Here the hops are separated from it by the perforated false bottom, with which the jack-back is provided; and the wort is by the pump K raised up to the coolers L. The instant the first wort quitted the boiler the liquor (water) in the copper-pan was let down into the copper, and the second wort was pumped up from the under-back to the pan. In a few minutes the third liquor acquires the proper heat (having been in the pan during two boilings), and is then run into the mash-tun to make the third mash; and the second wort is immediately let down from the pan into the copper to be boiled. The copper-pan now for the first time remains empty until the third mash is concluded: and then the third wort is thrown up by the pump into it. As soon as the second wort gets into the copper the fire is urged, and the hops are drawn up in a bucket from the jack-back by the tackle I, and returned to the copper to be boiled over again, and the rowser is set in motion. When the boiling of the second wort is concluded the fire is damped: it is run off into the jack-back, and pumped up to the coolers. The third wort is let down from the pan as soon as the second runs out, and the hops are put into the copper again to boil a third time as soon as they can be got up out of the jack-back. The third wort being boiled is run off into the jack-back,

and in its turn pumped up to the coolers: this concludes the day's brewing.

All these processes are conducted with surprising rapidity, though the copper in many of the large breweries contains 300 barrels. It is filled and emptied six times in the course of the brewing; three times with the liquor (water), and three times for the worts; and with no other exertion of the attendants than opening the several valves and cocks. Some of the breweries have three such coppers placed side by side, and each furnished with its suite of vessels: the operations are still conducted just in the same manner as here described. The mill is kept going all the time of the brewing to grind malt for the next day's mash, which, as fast as it is ground, is received into the bin over the mash-tun. The remainder of the day is spent in preparation for the next brewing. The grains, as soon as they are sufficiently cold, are thrown out of the mash-tun by men with shovels, and carried away in carts, as are also the hops. The engine after the day's work is set to pump up water from the well to the liquor-back for the next day. The copper is cleaned out by men who go down into it with brooms and scrapers to take off any foulness which adheres to its bottom; and after this it is filled, as well as the pan, ready for the next morning. In this manner the brewing is continued through the year, except six or eight weeks in the heat of the summer, when the coppers and other vessels are repaired.

When the worts are cooled down to the proper temperature they are drawn off into the square, or guile-tun, in which all the three worts are mixed together; a quantity of yeast is put in, and the fermentation begins very soon to shew itself by the whole body of the liquor teeming with innumerable small bubbles rising to the surface, each enveloped in a thin film of yeast, which, as the bubbles burst, collect into a head or froth, and float on the top of the liquor. The noise of these bubbles rising through the fluid causes a continual singing, and the whole mass appears as if boiling. By this process the porter acquires its spirituous quality, and is rendered clearer, from the great quantity of mucilaginous matter which is thrown off in the yeast. To free the liquor from this superabundant matter is the object of several of the processes it has gone through. In the mashing it is required to extract from the malt all the saccharum it contains: but the heat at which this must be done is also favourable for extracting a great proportion of the mucilage and glutinous parts of the malt, which must afterwards be separated from the wort. If the heat of the mashing liquor is too low, it will extract so much of these matters that all the subsequent processes can never separate them sufficiently to make the liquor fine; and at the same time it will not extract much saccharum. But by increasing the heat the mucilage becomes in a measure coagulated, and is not extracted in so great a degree, whilst the saccharum is taken up by the wort in a

full proportion. On the other hand, an excessive heat carries this too far, for it makes a complete paste of the malt by melting the gluten and mucilage; and the whole resembles a hasty pudding. This disaster, which the brewer calls *setting the goods*, spoils the whole process, as a great proportion of the water becomes combined with the malt in the state of paste, and will not run off; that portion which does remain unmixed and can be drained out has extracted little or nothing, either of mucilage or saccharum, from the malt. This state of things takes place in a greater or less degree whenever the extracting heat is taken too high; the other extreme we have spoken of. Between these the brewer endeavours to keep, and by his success in this simple point the quality and strength of his beer will be influenced most materially. No precise rules can be given for the actual heats, as they depend upon the nature of the malt, the heat used in drying it, the brown requiring less heat than pale: the quality of the water has also its share; and the quantity of malt mashed at once, because a large mash-tun loses less of its heat during the mashing than the small one; also the temperature of the atmosphere. In the process of boiling, the gross part of the mucilage, necessarily extracted by the wort, is coagulated, and in a manner precipitated, into distinct *fecula*, leaving the liquor which was before thick and muddy comparatively clear between the flakes, which are so large as to be individually visible. The boiling also extracts the bitter of the hops, and concentrates the wort by evaporating a part of the water used in the mashing: on spreading the wort thin in the coolers the *fecula* subside, and are left behind. A second separation of the finer mucilage takes place in the fermentation, and the liquor becomes more clear, at the same time the saccharum is changed into spirit, and it loses its sweetness. When the fermentation has advanced so far that the head of yeast begins to sink, it shews the process is past its greatest pitch, and the brewer must check it, or it would soon be succeeded by a second stage of fermentation which produces vinegar. This is done by the operation of cleansing, in which, as we have before stated, the yeast is carried off as fast as it is produced, and the fermentation gradually subsides: the beer is then conveyed to the store-vats, to be kept till wanted. Here the longer it is kept (provided it had a sufficient share of hops to bear keeping without becoming sour) the finer and better porter it will become: but it is in general, as before stated, sent away in the rough, and cleared by finings. The isinglass used in making these was, some time ago, very expensive, and so difficult to be procured at any rate that it put the brewers to great trouble. Mr. Murdoch of Birmingham at this time invented a preparation of fish-skins which answered the same purpose. For using this preparation Messrs. Brown and Parry, brewers, were prosecuted by the solicitor-general for an infringement of the excise regulations: much interesting information on this

subject will be found in the account of the trial which is printed in Mr. Clennel's *Agricultural Magazine*.

The colouring for porter is made by boiling coarse brown sugar in an iron pan with a small quantity of water, keeping it constantly stirred up; it is then set on fire and burned a few minutes, to give it the colour and flavour which might be obtained from brown malt. The fire is extinguished by putting on a cover. The residuum is now mixed up with water to the consistence of treacle, and makes the colouring, which is put to the beer while working in the square, and gives it the same colour and flavour it would have derived from being brewed from brown malt. Some brewers, to avoid the censures of the public, who restrain them to the use of malt and hops alone, concentrate a quantity of their best first wort, by boiling in the iron pan, and burn this instead of sugar, from which it does not materially differ.

A patent has been lately taken out by M. De Roche for colouring porter by the skins and husks of malt roasted to a coffee colour, and mixing them with the malt before mashing; or by infusing them in the water before brewing; or by mixing them with the beer. This would undoubtedly give colour; but we have some doubts of its communicating the flavour which is required.

PORTER (Francis), of Meath, in Ireland, was educated in France, and was divinity professor in the convent of Isidorus at Rome, where James II. gave him the title of his historiographer. He published *securis evangelica ad hæresis radices posita—pallinodia religionis prætensæ reformatæ—compendium annalium ecclesiasticorum regni Hiberniæ*, 4to.—*systema decretorum dogmaticæ*. &c. He died at Rome, 1702.

PORTERAGE. *s.* (from *porter*.) Money paid for carriage.

PORTES (Philip des), a French poet. He greatly improved the French language, and Henry III. bestowed on him 10,000 crowns, Charles IX. gave him 800 crowns of gold for a poem, and admiral de Joyeuse conferred on him an abbey for a sonnet. Though in high favour, he refused a bishopric. He died 1606. He wrote a translation of the psalms—imitations of Ariosto—christian poems—sonnets—elegies, &c.

PORTEUS (Beilby), a learned and most excellent English prelate, was the youngest but one of nineteen children, and was born at York in May 1731. His father and mother were natives of Virginia; but retired to this country, much to the injury of their private fortune, solely for the laudable purpose of giving every possible advantage of education to their children. Dr. Porteus received the first rudiments of his education at York, from whence he was removed to Ripon, and from this place at a very early age became a member of Christ's college, Cambridge, where he was admitted a sizar.

The private merits and studious accomplish-

P O R T E U S.

ments of Dr. Porteus soon advanced him to a fellowship of his college, and the active exertions of his friends soon afterwards procured him the situation of Esquire Bedell, an office of the university, both advantageous and honourable, but not precisely adapted to the character of his mind or habits of his life. He did not therefore long retain it, but wholly occupied himself with the care of private pupils, among whom was the late lord Grantham.

In the year 1757 he was ordained deacon, and soon afterwards priest. His first claim to notice as an author was his becoming a successful candidate for Seaton's prize for the best English poem on a sacred subject. Upon the great and superior merit of this composition, of which the subject was Death, we might with great propriety and justice dilate. It is an admirable poem, characterised by extraordinary vigour, warm sensibility, genuine piety, and accurate taste.

So much talent was not doomed long to remain in the silent and monastic obscurity of a college. In 1762 he became chaplain to archbishop Secker, and in 1765 married Miss Hodgson, the eldest daughter of Brian Hodgson, esq. of Ashbourne in Derbyshire. His first church preferments were two small livings in Kent, which he soon exchanged for Hunton, in the same county, and a prebend in the cathedral church of Peterborough, an option of the archbishop; and he not long afterwards was promoted to the rectory of Lambeth. In this same year, 1767, he took his doctor's degree at Cambridge, and on this occasion preached the commencement sermon.

From this period Dr. Porteus became more and more an object of public esteem and attention: he divided his time between Hunton, which place he always visited with delight, and left with regret, and Lambeth; and in 1769 he was made chaplain to his majesty, and master of the hospital of St. Cross, near Winchester. In the year 1773 he united with some other highly respectable individuals in respectfully recommending a revision of the liturgy and thirty-nine articles; an application, however, in which they failed.

In 1776 Dr. Porteus was promoted to the bishopric of Chester, where he immediately and effectually distinguished himself by a faithful discharge of the duties of his high station.

In the interval between this period and his promotion to the see of London, the bishop evinced his zeal and ardour for the promotion of piety, benevolence, and the public good, by the part which he took in various matters which were objects of popular discussion. The principal among these were the protestant association against popery; the Sunday debating society; the civilization of the negroes, and the establishment of Sunday schools. In the first of these, at the same time that the bishop demonstrated his universal charity and candour, he was not negligent in guarding those committed to his care against the dangerous and exclusive tenets of popery. In the second, his

exertions effectually put a stop to a very alarming evil, to meetings which were calculated to destroy every moral sentiment, and extinguish every religious principle. With respect to the civilization and conversion of the negroes, he indulged the feeling nearest to his heart; but although he had the happiness to see the final accomplishment of his wishes, his first endeavours were not effectual. The plan of Sunday schools was first introduced by Mr. Richard Raikes, of Gloucester, and as soon as ever the bishop was convinced by time and experience of their real utility and importance, he promoted them in his diocese, and by an admirable letter which he addressed to his clergy, he explained their advantages, and recommended their universal adoption.

In November 1787, immediately after the death of bishop Lowth, Dr. Porteus was elevated to the see of London; and from this time to the termination of his life devoted himself with exemplary zeal and assiduity to the various duties of his exalted office. We regret that our limits will not allow us to attempt even a sketch of his conduct, during this period. Suffice it to say that he was ready in every "good word and work," that he was "instant in season and out of season," and that while he acted with firmness and patriotism as a peer in parliament, he acted with primitive simplicity and zeal as a minister of the gospel. He relieved the distressed, consoled the afflicted, removed the doubts of the wavering, refuted the objections of the infidel, and was a "terror to evil doers," (in whatever stations of life they were found) "and a praise to them that do well." This truly good English bishop died at Fulham, May the 13th, 1807; and was buried in the church-yard of Sundridge in Kent, where he had built and endowed a church at his own expence.

Memoirs of his life have been published by his nephew, the rev. Robert Hodgson, to which we must refer for farther particulars. This gentleman has also published the complete works of the bishop, being principally theological, and highly valuable, in 6 vols. 8vo.

The classical attainments of this prelate, if not acutely critical, or exceedingly profound, were entitled to very considerable esteem. They were ready money; always at hand; he had them when he wanted them. His taste for poetry was exquisite; his theological knowledge various and comprehensive. He was sometimes ignorantly or calumniously denominated a methodist: he was no such thing; his piety was animated but not fanatical, and he was the general friend of religious liberty. The great feature of his character was benevolence, prompt, active, universal benevolence, founded upon the principles of the Christian religion. Though he was a sound churchman, he was not a bigot: he loved good men of all persuasions, and would often express his full conviction of meeting them in that world where the distinction of churchman and dissenter will be no more known.

PORTGLAVE. *s.* (*porter* and *glaise*, Fr. and Erse.) A sword-bearer (*Ainsworth*).

PORTGREVE, or **PORTGRAVE**, anciently the principal magistrate in ports and other maritime towns. The word is formed from the Saxon, *port*, and *geref*, a governor. It is sometimes also written *portreve*. It is said by Camden, that the chief magistrate of London was anciently called *port-greve*, which was exchanged by Richard I. for two bailiffs; and these again gave place, in the reign of king John, to a mayor, who was an annually elected magistrate.

PORTICI, a village four miles E.S.E. of the city of Naples, situate on the sea-side, near mount Vesuvius. Here is a palace of the king of Naples, enriched with a vast number of fine statues, and other remains of antiquity, taken out of the ruins of Herculaneum.

PORTICO, in architecture, a kind of gallery on the ground; or a piazza encompassed with arches supported by columns, where people walk under cover. The roof is usually vaulted, sometimes flat. The ancients called it *lacunar*. Though the word *portico* be derived from *porta*, gate, door; yet it is applied to any disposition of columns which form a gallery, without any immediate relation to doors or gates. The most celebrated porticos of antiquity were those of Solomon's temple, which formed the atrium or court, and encompassed the sanctuary; that of Athens, built for the people to divert themselves in, and where-in the philosophers held their disputes and conversations (see **PORCH**); and that of Pompey at Rome.

PORTIO DURA, in anatomy. One branch of the seventh pair of nerves is called *portio dura*, the hard portion, either from its being more firm than the other, or because it runs into the hard part of the skull; and the other the *portio mollis*, or soft portion. Facial nerve. This nerve arises near the pons from the crus of the brain, enters the petrous-portion of the temporal bone, gives off a branch into the tympanum, which is called the *chorda tympani*, and then proceeds to form the *pes anserinus* on the face, from whence the integuments of the face are supplied with nerves. See **FACIAL NERVE**.

PORTIO MOLLIS. Auditory nerve. In anatomy. This nerve arises from the medulla oblongata and fourth ventricle of the brain, enters the petrous portion of the temporal bone, and is distributed, by innumerable branches, not only to the cochlea, but also to the membrane lining the vestibulum and semicircular canals, and is the immediate organ of hearing.

PORTION. *s.* (*portion*, Fr. *portio*, Latin.) 1. A part (*Waller*). 2. A part assigned; an allotment; a dividend (*Waller*). 3. Part of an inheritance given to a child; a fortune (*Prior*). 4. A wife's fortune.

To **PORTION.** *v. a.* (from the noun.) 1. To divide; to parcel (*Rowe*). 2. To endow with a fortune (*Pope*).

PORTIONER. *s.* (from *portion*.) One that divides.

PORTLAND, a peninsula in Dorsetshire, surrounded by inaccessible rocks, except at the landing-place, where there is a strong castle, called Portland Castle, built by Henry VIII. It lies on the S.W. side of Weymouth Bay; and is chiefly noted for its stone, which is used in London for building the finest structures. Its S. extremity, called Portland Point, is in lon. 2. 29 W. Lat. 50. 29 N.

PORTLAND, a seaport of the United States, capital of Cumberland county, in the district of Main. It is seated on a peninsula, and has an excellent harbour, 150 miles N.N.E. of Boston. Lon. 69. 30 W. Lat. 44. 10 N.

PORTLAND ISLANDS, a cluster of islands in the S. Pacific Ocean. They are low, and covered with wood; and the centre one is in lon. 149. 8 E. Lat. 2. 38 S.

PORTLAND STONE, in mineralogy. See **MARMOR**.

PORTLAND VASE, a celebrated funeral vase which was long in possession of the Barberini family; but which was lately purchased for 1000 guineas by the late duke of Portland, from whom it has derived its present name. Its height is about ten inches, and its diameter where broadest six. There are a variety of figures upon it of most exquisite workmanship, in bas-relief of white opaque glass, raised on a ground of deep blue glass, which appears black except when held against the light. It appears to have been the work of many years, and there are antiquarians who date its production several centuries before the Christian era; since, as has been said, sculpture was declining in excellence in the time of Alexander the Great.

Respecting the purpose of this vase, and what the figures on it were meant to represent, there have been a variety of conjectures, which we have no inclination to enumerate.

PORTLANDIA, in botany, a genus of the class pentandria, order monogynia. Corol funnel-form, dilated at top; anthers longitudinal, from four to six; capsule five-sided, retuse, two-celled, two-valved, many-seeded, crowned with the five-leaved calyx. Four species; natives of the West Indies or America.

The only cultivated species is *P. grandiflora*, great-flowered portlandia: with shrubby upright stem, branched, knotty, with a smooth bark cracking longitudinally; buds gummy; anthers five; leaves lance-elliptic, opposite, very entire, shining; flowers axillary, solitary, peduncled, a little nodding, large, beautifully white, most fragrant at night; in the bud yellowish tipped with red. A native of the West Indies; flowers in July and August; may be raised from seeds or cuttings, but requires the heat of a stove.

PORTLINESS. *s.* (from *portly*.) Dignity of mien; grandeur of demeanour; bulk of personage (*Camden*).

PORTLY. *a.* (from *port*.) 1. Grand of mien (*Spenser*). 2. Bulky; swelling (*Shakspeare*).

PORTMAN. *s.* (*port* and *man*.) An inhabitant or burgess, as those of the cinque ports.

PORTMANTEAU, a cloak bag of cloth, leather, &c. in which the cloak, linen, and other habiliments of travellers are disposed and laid on the horse's crupper. The same name is also given to a piece of joiners' work, fastened to the wall in a wardrobe, armoury, &c. proper for the hanging on of cloaks, hats, &c.

PORTO, a small seaport of Italy, in the patrimony of St. Peter. It is the see of a bishop, who is generally a cardinal, and dependent only on the pope. It is 10 miles S.W. of Rome.

PORTO. See **OPORTO**.

PORTO BELLO, a seaport of Terra Firma, on the north coast of the isthmus of Darien, with a large and commodious harbour. It is a very unhealthy place; and the country around it swarms with toads in such multitudes, as hide the surface of the earth. Before the abolition of the trade by the galleons, in 1748, and the introduction of register ships, Porto Bello was the great mart for the rich commerce of Peru and Chili. At the season when the galleons were expected, the product of all the mines, and other valuable commodities, of those countries, were sent by sea to Panama, and thence conveyed across the isthmus, partly on mules, and partly down the river Chagre, to Porto Bello. The town stands close to the sea, on the side of a mountain that surrounds the harbour, which is safe and commodious. It was taken in 1742, by admiral Vernon, who demolished the fortifications; but it has since been strongly fortified. It is 60 miles N. by E. of Panama, and 300 W. of Carthagena. Lon. 79. 50 W. Lat. 9. 33 N.

PORTA PRAYA, a town and bay of St. Jago, one of the Cape Verd islands. The town stands on an elevated plain, and is the residence of the Portuguese governor of the islands. Lon. 23. 29 W. Lat. 14. 54 N.

PORTO DEL PRINCEPE, a seaport on the north coast of Cuba, with a good harbour. Near it are several springs of bitumen. Lon. 78. 15 W. Lat. 21. 52 N.

PORTO REAL, a seaport of Spain, in Andalusia, on the E. side of the bay of Cadiz, near the mouth of the Gaudalete, seven miles E. of Cadiz.

PORTO RICO, an island of the West Indies, 60 miles E. of St. Domingo, belonging to the Spaniards. It is 120 miles long and 40 broad, diversified with woods, valleys, and plains, and watered by springs and rivers, but unhealthy in the rainy seasons. It produces sugar, rum, ginger, cotton, maize, and rice; and there are so many cattle, that they are often killed for the sake of the skins alone. Here are a great number of uncommon trees, and there is a little gold in the N. part of the

island. St. Juan de Porto Rico is the capital.

PORTO SANTO, an island in the Atlantic, the least of the Madeiras, 15 miles in circumference. In 1418, a Portuguese ship, coasting along the African shore, was driven out to sea by a sudden squall, and when they all expected to perish, they discovered this island, which, on account of their escape, they named Porto Santo; and hence they described the island of Madeira. It produces little corn; but there are oxen and wild hogs, and a vast number of rabbits. Its most valuable productions are dragons-blood, honey, and wax. It has no harbour, but good anchorage in the road. Lon. 16. 25 W. Lat. 32. 58 N.

PORTO SEGURO, a province of Brasil, S. of that of Ilheos, and N. of Spiritu Santo. It is very fertile. The capital is of the same name, and seated on the top of a rock, at the mouth of a river that flows into the Atlantic. Lon. 40. 20 W. Lat. 16. 40 S.

PORTO VECCHIO, a seaport of Corsica, seated on a bay on the E. coast of the island, 40 miles S.E. of Ajaccio. Lon. 9. 10 E. Lat. 41. 40 N.

PORTO VENERO, a seaport on the coast of Genoa, at the entrance of the gulf of Spezia. It has a good harbour, and is seated on the side of a hill, at the top of which is a fort, 45 miles S.E. of Genoa. Lon. 9. 38 E. Lat. 44. 5 N.

PORTRAIT. *s.* (*pourtrait*, Fr.) A picture drawn after the life (*Prior*). See **PAINTING**.

To PORTRAIT. *v. a.* (*pourtraire*, French.) To draw; to pourtray (*Spenser*).

PORTRAITURE. *s.* (*pourtraiture*, Fr.) Picture; painted resemblance (*Brown*).

To PORTRAY. *v. a.* (*pourtraire*, French.)

1. To paint; to describe by picture (*Dryden*).

2. To adorn with pictures (*Milton*).

PORTREE, a town of Scotland, on the E. side of the isle of Skye, one of the Hebrides. The inhabitants trade chiefly in black-cattle, sheep, and kelp. It has an excellent harbour, sheltered at its mouth by the isle of Raaza. Lon. 6. 16 W. Lat. 57. 33 N.

PORTRESS. *s.* (from *porter*.) A female guardian of a gate.

PORTSEA, an island between Chichester bay and the harbour of Portsmouth, in Hampshire. It is a low tract about 14 miles in circumference, separated from the mainland on the N. by a creek, over which are two bridges, one for the entrance and the other for the departure of passengers. At the S.W. extremity of it is situate the town of Portsmouth.

PORTSMOUTH, a borough and seaport in Hampshire, with a market on Thursday and Saturday. It is the most considerable haven for men of war, and the most strongly fortified place in England. Its capacious harbour is made by a bay running up between the island of Portsea, on which the town is situate, and the opposite peninsula, having a narrow entrance commanded by the town and fort.

Many of the largest ships are always laid up here; and, in time of war, it is the principal rendezvous of the grand channel fleet. The docks, arsenals, storehouses, barracks, &c. are all of capital magnitude, and kept in the most perfect order. The town is governed by a mayor, and entirely supported by the resort of the army and navy. To the S. of it is the noted road of Spithead, where the men of war anchor when prepared for actual service.—Portsmouth has one spacious church, and two neat chapels; the latter are in a part of the town called Portsea, built on what was formerly called Portsmouth Common, and is now become much larger than the parent town. The number of inhabitants in 1801 was 33,226, exclusive of the males belonging to the army and navy. Portsmouth is the birthplace of the celebrated philanthropist Jonas Hanway. It is 20 miles S.S.E. of Winchester, and 72 S.W. of London. Lon. 1. 6 W. Lat. 50. 47 N.

PORTSMOUTH, the capital of New Hampshire, in Rockingham county, with three churches. It is the largest town and the only seaport in the state, seated on the Piscataqua, two miles from the ocean. Its harbour is one of the finest on the continent, well defended by nature, both against storms and an enemy. It is 50 miles N. by E. of Boston. Lon. 70. 42 W. Lat. 43. 5 N.

PORTSMOUTH, a town of Virginia, in Norfolk county, on the W. side of Elisabeth river, opposite Norfolk; both which towns constitute but one port of entry. It is 107 miles E.S.E. of Richmond. See NORFOLK.

PORTSMOUTH, a town of the state of Ohio, on the E. side of the Sciota, at its confluence with the Ohio. It has a court-house; and is the depot for the merchandise of the settlements of the upper parts of the Sciota. It is 60 miles S. of Chillicothe. Lon. 83. 8 W. Lat. 38. 22 N.

PORTSOY, a seaport of Scotland, in Banffshire, with manufactures of fine linen and sewing thread. Near it are found a vein of serpentine, called Portsoy marble; a species of asbestos, of a greenish colour, which has been wrought into incombustible cloth; and a brilliant kind of granite of a flesh colour. Portsoy stands on a point of land projecting into Murray Frith, nine miles W. of Banff.

PORTUGAL, the most western country of Europe, 350 miles in length, and 120 in breadth; bounded on the W. and S. by the Atlantic, and on the E. and N. by Spain. It is divided into six provinces, Estremadura, Beira, Entre Douero e Minho, Tra los Montes, Alentejo, and Algarva. Though Spain and Portugal are in the same climate, the air of the latter is more temperate than that of the former, on account of the neighbourhood of the ocean. Corn is not plentiful, for little attention is paid to husbandry; and maize, imported from Africa, is used by the peasants instead of wheat. There is a great number of barren mountains, and many fine vales remain in a state of nature: yet there is plenty of

olives, vines, oranges, lemons, nuts, almonds, figs, and raisins; and it is famous for excellent wines. Much salt is made also from the seawater, especially in the bay of St. Ubes, whence a great deal is exported. The manufactures are few and unimportant, but the chief are those of woollen cloth. The foreign trade consists either of the exportation of the produce of the country, or in the merchandise which is received from its foreign settlements; such as sugar, tobacco, rum, cotton, indigo, hides, brasil and other woods for dyeing, and many excellent drugs. Beside these, it has gold, silver, diamonds, and other precious stones from America. The horses of Portugal were formerly in great esteem, but now mules are preferred; the horned cattle are small and lean; sheep are also neglected, and not numerous; but swine abound, and are fed with excellent acorns. Toward the frontiers of Spain there are mountains in which was formerly got gold and silver; and the river Tajo, the Tagus of the ancients, was celebrated by their poets for its golden sands. There are mines of iron, copper, tin, and lead, quarries of marble, and some precious stones. The principal rivers are the Tajo, Douero, Guadiana, Minho, and Mondego. The Portuguese are indolent, and so fond of luxury, that they spend all their wealth in the purchase of foreign merchandise. The women are addicted to gallantry, for which reason the men are jealous of their wives, and allow them but little liberty. The government is monarchical, but the royal authority is limited; for the sovereign cannot raise any more taxes than were settled in 1674. The established religion is the Roman Catholic, and there are two archbishops, and 10 bishops, beside a patriarch; also three severe inquisitions, and yet there are a great number of concealed Jews. The authority of the pope is so great, that the king cannot confer any benefice without his consent. In 1580, there was a failure in the royal line, and Philip II, king of Spain subdued the country; but, in 1640, there was a great revolution, and the crown was conferred on John duke of Braganza (king John IV.) whose descendants still enjoy it. In 1807, in consequence of the French invading Portugal, the whole of the royal family embarked on a fleet in the Tajo, and on December 1st sailed for Brasil, escorted by four British men of war. A regency was previously appointed, but no attempt was made to resist the French, who soon after entered the capital. The French governor, Junot, immediately abolished the regency, and began to treat the country as a conquest to France. In 1808, the English sent an army to aid the Portuguese; and Junot was defeated by sir Arthur Wellesley on the 21st of August at Vimiera. This battle was followed by a convention, and all the French forces were sent by sea to their own country. Fresh forces, however, were sent against the English; and the contending armies of England and France have ever since continued to oppose each other with such mutable success, that it is difficult to conjecture which will be

enabled ultimately to quit the country. The English army is under the command of sir Arthur Wellesley, now earl Wellington, who has all along displayed great judgment, military skill, and heroism. The capital of Portugal is Lisbon.

PORTULACA. Purslane. In botany, a genus of the class dodecandria, order monogynia. Calyx two-cleft, petals five; capsule one-celled, opening transversely all round. Five species; East and West Indies, Egypt, America. The following is the only species cultivated:

P. oleracea. Garden purslane. Stem pro-cumbent, succulent; leaves wedge-form, fleshy, sessile, clustered, entire; flowers sessile, scattered, yellow; stamens from eight to fifteen; seeds round, black. It was formerly much used as a salad and pickle, but is now seldom had recourse to. A native of the Indies and America.

Several species of *talinum* are often confounded with *portulaca*, on account of their general resemblance.

PORTULACARIA, in botany, a genus of the class pentandria, order trigynia. Calyx two-leaved, coloured; petals five; seed one; three-sided and winged. One species, *P. afra*, African purslane tree; stem branched, about three feet high, succulent; leaves succulent, roundish, of a red or purplish colour. It has not been known to flower in our own climate. A native of Africa, and easily increased by cuttings of the stems or branches.

PORTUS (Francis), of Candia, was educated at Ferrara, where he taught, and afterwards at Geneva, the Greek language. He died 1581, aged 70. He wrote additions to Constantine's Greek lexicon, folio; Commentaries on Pindar, Thucydides, Longinus, Xenophon, and other Greek authors. His son *Emilius* was also an able Grecian, and published *Dictionarium Ionicum & Doricum*, Græco-Latin, 2 vols. 8vo.; a translation of *Suidas*, and other learned works. He was professor of Greek at Lausanne and Heidelberg.

PORWIGLE. *s.* A tadpole or young frog not fully shaped (*Brown*).

PORY. *a.* (*poreux*, Fr. from *pore*.) Full of pores (*Dryden*).

POSATA, a town of the island of Sardinia, on the E. coast, 45 miles E.S.E. of Castel Aragonese. Lon. 9. 30 E. Lat. 40. 36 N.

TO POSE. *v. a.* (zepose, Saxon.) 1. To puzzle; to gravel; to put to a stand or stop (*Hammond*). 2. To oppose; to interrogate (*Bacon*).

POSE, in heraldry, denotes a lion, horse, or other beast, standing still, with all his four feet on the ground.

POSEGA, a town of Slavonia, and capital of a county of the same name, taken from the Turks by the Imperialists, in the year 1687: nineteen miles N.E. Gradisca, and twenty N.N.W. Brod. Lon. 18. 59 E. Lat. 45. 36 N.

POSEN, or **POSANIA**, a town of Poland, and capital of a palatinate of the same name, in Great Poland, situated on the Warta, handsome, but not very large. It is enclosed with a double wall, and a deep moat; and on the other side of the Warta, it has two suburbs, namely Szrodka and Waliszewo, which are surrounded with a large morass. Both the city and suburbs are subject to frequent inundations, by the overflowing of the river. The castle stands on an island in the Warta, and is a good structure. It contains several churches and convents, and is the see of a bishop. The bishop's palace stands near the cathedral, which is a fine structure, and between the morasses. This is the first in rank, and the most ancient bishop's see in Poland.

POSER. *s.* (from *pose*.) One that asks questions to try capacities; an examiner (*Bacon*).

POSITED. *a.* (*positus*, Latin.) Placed; ranged (*Hale*).

POSITION. *s.* (*position*, Fr. *positio*, Lat.)

1. State of being placed; situation (*Temple*). 2. Principle laid down (*Hooker*). 3. Advancement of any principle (*Brown*). 4. (In grammar.) The state of a vowel placed before two consonants, as, *pompous*.

POSITION, in astronomy, relates to the sphere. The position of the sphere is either right, parallel, or oblique; whence arise the inequality of days, the difference of seasons, &c.

POSITION (Circles of), are circles passing through the common intersections of the horizon and meridian, and through any degree of the ecliptic, or the centre of any star, or other point in the heavens; used for finding out the position or situation of any star. These are usually counted six in number, cutting the equator into twelve equal parts which the astrologers call the celestial houses.

POSITION, in arithmetic, called also false position, or supposition, or rule of false, is a rule so called, because it consists in calculating by false numbers supposed or taken at random, according to the process described in any question or problem proposed, as if they were the true members, and then from the results, compared with that given in the question, the true numbers are found. It is sometimes also called trial-and-error, because it proceeds by trials of false numbers, and thence finds out the true ones by a comparison of the errors.

Position is either single or double.

Single position is when only one supposition is employed in the calculation. And

Double position is that in which two suppositions are employed.

To the rule of position properly belong such questions as cannot be resolved from a direct process by any of the other usual rules in arithmetic, and in which the required numbers do not ascend above the first power: such, for example, as most of the questions, usually brought to exercise the reduction of simple equations in algebra. But it will not bring out true answers when the numbers sought ascend above the

first power; for then the results are not proportional to the positions. See ARITHMETIC.

POSITION (Centre of), the same as CENTRE OF GRAVITY; which see.

POSITIONAL. *a.* (from *position*.) Respecting position (*Brown*).

POSITIVE. *a.* (*positivus*, Latin.) 1. Not negative; capable of being affirmed; real; absolute (*Locke*). 2. Absolute; particular; direct; not implied (*Bacon*). 3. Dogmatical; ready to lay down notions with confidence (*Rymer*). 4. Settled by arbitrary appointment (*Hooker*). 5. Having the power to enact any law (*Swift*). 6. Certain; assured: as, *he was positive as to the fact*.

POSITIVE DEGREE, in grammar, is the adjective in its simple signification, without any comparison.

POSITIVE ELECTRICITY. In the Franklinian system, all bodies supposed to contain more than their natural quantity of electric matter are said to be positively electrified; and those from whom some part of their electricity is supposed to be taken away are said to be electrified negatively. These two electricities being first produced, one from glass, the other from amber or rosin, the former was called vitreous, the other resinous, electricity. See ELECTRICITY.

POSITIVELY. *ad.* 1. Absolutely; by way of direct position (*Bacon*). 2. Not negatively (*Bentley*). 3. Certainly; without dubitation (*Dryden*). 4. Peremptorily; in strong terms (*Sprat*).

POSITIVENESS. *s.* (from *positive*.) 1. Actuality; not mere negation (*Norris*). 2. Peremptoriness; confidence (*Gov. of Tongue*).

POSITIVITY. *s.* (from *positive*.) Peremptoriness; confidence. A low word (*Watts*).

POSITURE. *s.* (*positura*, Latin.) The manner in which any thing is placed (*Bramhall*).

POSNET. *s.* (from *bassinet*, French.) A little basin; a porringer; a skillet (*Bacon*).

POSSE COMITATUS, in law, signifies the power of the county, or the aid and assistance of all the knights, gentlemen, yeomen, labourers, servants, apprentices, &c. and all others within the county that are above the age of fifteen, except women, ecclesiastical persons, and such as are decrepit and infirm. This posse comitatus is to be raised where a riot is committed, a possession kept upon a forcible entry, or any force of rescue used contrary to the king's writ, or in opposition to the execution of justice; and it is the duty of all sheriffs to assist justices of the peace in the suppression of riots, &c. and to raise the posse comitatus, or to charge any number of men for that purpose.

To POSSESS. *v. a.* (*possessus*, Latin.) 1. To have as an owner; to be master of; to enjoy or occupy actually (*Carew*). 2. To seize; to obtain (*Hayward*). 3. To give possession or command of any thing; to make master of

(*Shakspeare*). 4. To fill with something fixed (*Addison*). 5. To have power over, as an unclean spirit (*Roscommon*). 6. To affect by intestine power (*Shakspeare*).

POSSE/SSION. *s.* (*possession*, French; *possessio*, Latin.) 1. The state of owning or having in one's own hands or power; property (*Milton*). 2. The thing possessed (*Temple*).

POSSESSION is two-fold; actual, and in law: actual possession is, when a man actually enters into lands and tenements to him descended; possession in law is, when the lands or tenements are descended to a man, and he has not as yet actually entered into them.

To POSSE/SSION. *v. a.* To invest with property: obsolete (*Carew*).

POSSE/SSIONER. *s.* (from *possession*.) Master; possessor (*Sidney*).

POSSESSIVE. *a.* (*possessivus*, Latin.) Having possession.

POSSESSIVE, in grammar, a term applied to pronouns which denote the enjoyment or possession of any thing, either in particular or in common: as, *meus*, mine, and *tuus*, thine; *noster*, ours, and *vester*, yours.

POSSE/SSOR. *s.* (*possessor*, Latin; *posseur*, French.) Owner; master; proprietor (*Law*).

POSSESSORY. *a.* (*possessoire*, Fr. from *possess*.) Having possession (*Howell*).

PO/SSET. *s.* (*posca*, Latin.) Milk curdled with wine or any acid (*Suckling*).

To PO/SSET. *v. a.* To turn; to curdle: as milk with acids: not used (*Shakspeare*).

POSSIBILITY. *s.* (*possibilit  *, Fr.) The power of being in any manner; the state of being possible (*Norris*).

PO/SSIBLE. *a.* (*possible*, French; *possibilis*, Latin.) Having the power to be or to be done; not contrary to the nature of things (*Locke*).

PO/SSIBLY. *ad.* (from *possible*.) 1. By any power really existing (*Milton*). 2. Perhaps without absurdity (*Clarendon*).

POST. *s.* (from the Latin, *positus*, set or placed.) 1. A hasty messenger; a courier who comes and goes at stated times (*Ben Jonson*). 2. Quick course or manner of travelling (*Dryden*). 3. Situation; seat (*Burnet*). 4. Military station (*Addison*). 5. Place; employment; office (*Collier*). 6. A piece of timber set erect (*Wotton*).

Post is, in the opinion of many, derived from horses for the conveyance of dispatches, being *positi*, or placed at convenient distances, as relays or changes for those fatigued, and unable to proceed the whole journey with the desired speed. Hence it has become the practice to term horses employed for this and similar purposes, post-horses; their riders, post-boys; the houses for the reception of letters thus conveyed, post-offices; and even the drivers of chaises, postilions; and their vehicles post-chaises; it is natural, besides, to say, he who continues a journey on fresh horses, without stopping for more than necessary refreshment, rides post. The spaces between certain inns, for the reception of travellers in England,

forming a post, varies from twelve to fifteen miles, beyond which it is deemed imprudent to urge a horse, without a long interval of repose; and the charges per mile for horses furnished from those inns have occasioned continual discontent, and frequent general meetings of certain classes of the public.

Before the establishment of a system for the conveyance of important intelligence, and in the earliest state of society, it may be supposed, horses were seized, or, to use a modern term, put into requisition where they were wanted; though it is still more probable, that men were tutored to run from station to station, as is now the practice in the Eastern nations, whose couriers fly their prescribed distance with astonishing velocity, and delivering their dispatches to fresh persons, they are by this means conveyed almost as rapidly as by horses. The emperor Trajan appears to have been the first who ordained the keeping of horses for this purpose only, and the example has appeared so rational to succeeding generations, that it is highly probable posting of every description has now reached its full possible perfection.

It was customary in ancient times to convey information by boats, and in chariots, exclusive of on foot and horseback; nay, even pigeons have been taught to fly from place to place, with letters attached to them: in England, men who conveyed letters were called carriers, which was certainly, in the then state of the roads, a much more appropriate term than the present, implying, in one acceptation, exceeding swiftness. England appears to be the first country in Europe which formed a regular establishment for this purpose: though it was not till a late period that it assumed any thing like a regular form even here. In the reign of Edward VI., however, some species of post must have been set up, as an act of parliament passed in 1548, fixing the rate of post-horses at one penny per mile: the post-horses here referred to were, it is probable, chiefly for travelling, and the carriage of letters or packets only an occasional service. In 1581, we find in Camden's Annals mention made of a chief post-master for England being appointed. How his office was managed, does not clearly appear; the limited state of the correspondence of the country probably rendered it of trifling consequence. King James I. originally erected a post-office under the controul of one Matthew de Quester, or de l'Equester, for the conveyance of letters to and from foreign parts; which office was afterwards claimed by lord Stanhope, but was confirmed and continued to William Frizel and Thomas Witherings, by king Charles I., in 1632. Previous to this time it would appear that private persons were in the habit of conveying letters to and from foreign parts; all such interference with the postmaster's office is, therefore, expressly prohibited. King Charles, in 1635, erected a letter-office for England and Scotland, under the direction of the above Thomas Witherings. The rates

of postage then established were, two-pence for every single letter for a distance under 80 miles; four-pence from 80 to 140 miles; six-pence above 140 miles. The allowance to the post-masters on the road for horses employed in these posts was fixed at two-pence halfpenny per mile for every single horse. All private inland posts were discharged at this time; and in 1637, all private foreign posts were in like manner prohibited. The posts thus established, however, extended only to a few of the principal roads; and the times of transmission were not in every case so certain as they ought to have been.

Witherings was superseded for abuses in the execution of his offices in 1640, and they were sequestrated into the hands of Philip Burlamachy, to be exercised under the care and oversight of the king's principal secretary of state. On the breaking out of the civil war, great confusions and interruptions were necessarily occasioned in the conduct of the letter-office; but it was about that time that the outline of the present more extended and regular plan seems to have been conceived by Mr. Edmond Prideaux, who was afterwards appointed attorney-general to the commonwealth. He was chairman of a committee in 1642, for considering the rate of postage to be set upon inland letters; and some time was appointed post-master by an ordinance of both houses of parliament, in the execution of which office he first established a weekly conveyance of letters into all parts of the nation. In 1653, this revenue was farmed for 10,000*l.* for England, Scotland, and Ireland; and after the charge of maintaining post-masters to the amount of 7000*l.* per annum was saved to the public. Prideaux's emoluments being considerable, the common council of London endeavoured to erect another post-office in opposition to his; but they were checked by a resolution of the house of commons, declaring that the office of postmaster is, and ought to be, in the sole power and disposal of the parliament. This office was farmed by one Mauby, in 1654. In 1656, a new and regular general post-office was erected by the authority of the protector and his parliament, upon nearly the same model that has been ever since adopted, with the following rates of postage: for 80 miles distance, a single letter two-pence; for a greater distance, not out of England, three-pence; to Scotland four-pence. By an act of parliament passed soon after the Restoration in 1660, the regulations settled in 1656 were re-established, and a general post-office similar to the former, but with some improvements, was erected. In 1663, the revenue of the post-office was found to produce 21,500*l.* annually. In 1685, it was made over to the king, as a branch of his private income, and was then estimated at 65,000*l.* per annum. The year after the Revolution, the amount of the post-office revenue was 90,504*l.* 10*s.* 6*d.* At the Union, the produce of the English post-office was stated to be 101,101*l.* In 1711, the

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former establishments of separate post-offices for England and Scotland were abolished; and by the stat. 9 Anne, c. 10. one general post-office, and one postmaster-general, were established for the whole united kingdom; and this postmaster was empowered to erect chief letter-offices at Edinburgh, at Dublin, at New York, and other proper places in America, and the West Indies. The rates of postage were also increased at this time, as follows: in England, for all distances under 80 miles, three-pence; above 80 miles, four-pence. From London to Edinburgh, six-pence. In Scotland, under 50 miles, two-pence; from 50 to 80 miles, three-pence; above 80 miles, four-pence. In Ireland, under 40 miles, two-pence; above 40 miles, four-pence. By the above act, all persons, except those employed by the postmaster, were strictly prohibited from conveying letters. That year the gross amount of the post-office was 111,461l. 17s. 10d. The net amount, on a medium of the three preceding years, was, in the printed report of the commissioners for the equivalent, stated to be for England, 62,000l., and for Scotland, 2000l. In 1754, the gross revenue of the post-office for Great Britain amounted to 210,663l.; in 1764, to 281,535l.; and in 1774 to 345,321l. The privilege of franking letters had been enjoyed by members of parliament from the first erection of the post-office; the original design of this exemption was, that they might correspond freely with their constituents on the business of the nation. By degrees the privilege came to be shamefully abused, and was carried so far, that it was not uncommon for the servants of members of parliament to procure a number of franks for the purpose of selling them; an abuse which was easily practised, as nothing more was required for a letter's passing free than the subscription of a member on the cover. To restrain these frauds, it was enacted, in 1764, that no letter should pass free unless the whole direction was of the member's writing, and his subscription annexed. Even this was found too great a latitude; and by a new regulation in 1784, no letter was permitted to go free, unless the date was marked on the cover, in the member's own hand-writing, and the letter put into the office the same day. Each member, too, was restricted to the sending of ten and the receiving of fifteen letters. That year the rates of postage were raised in the following proportions: an addition of one penny for a single stage; one penny from London to Edinburgh; one penny for any distance under, and two-pence for any distance above 150 miles. An addition to the revenue of 120,000l. was estimated to arise from these regulations and additional rates. In all the statements of duties upon postage of letters given in this account, the rates mentioned are those upon single letters: double letters pay double, treble letters treble, an ounce weight quadruple postage; all above are charged by the weight, in the same proportion.

About the year 1784, a great improvement

was made in the mode of conveying the mails, upon a plan first suggested in 1782, by Mr. John Palmer. Diligences and stage-coaches, he observed, were established to every town of note in the kingdom; and he proposed that government, instead of sending the mails in the old mode by a boy on horseback, and in carts, should contract with the masters of these diligences to carry the mail, along with a guard for its protection. This plan, he shewed, could not fail to ensure much more expeditious conveyance, the rate of travelling in diligences being far quicker than the rate of the post; and it was easy to carry it into execution with little additional expence, as the coach-owners would have a strong inducement to contract at a cheap rate for conveying the mail, on account of the additional recommendation to passengers, their carriages would thereby acquire in point of security, regularity, and dispatch. Though government heartily approved of this plan, and the public at large were satisfied of its utility, yet, like all new schemes, however beneficial, it met with a strong opposition: it was represented by a number of the oldest and ablest officers in the post-office, not only as impracticable, but dangerous to commerce and the revenue. Notwithstanding this opposition, however, it was at last established, and gradually extended to many different parts of the kingdom; and, upon a fair comparison, it appeared that the revenue was very considerably improved, though Mr. Palmer's numerous reforms, and the great number of new appointments which they rendered necessary, greatly increased the former expence of management. The conveyance of the mails on the new plan was contracted for, after the two first years trial, at 20,000l. per annum less than the sum first estimated by Mr. Palmer. Those that have travelled in these vehicles need not be informed of their rapid motions, nor of the constant uninterrupted assiduity of the coachmen, the guards, the officers of the different post-towns, and even of the hostlers, to expedite their progress, and to those who have not, and foreigners, the regulations under which they are placed must give an exalted idea of the commercial character of the British nation.

At eight o'clock in the evening of every day, the mail coaches depart from London, freighted with such letters and packets as have been conveyed during the day, either to the office in Lombard-street or to that place from the various receiving-offices scattered in every direction, by the letter-carriers, who walk through their districts ringing a bell from five o'clock to six, to collect those letters which have been delayed to that late hour. The coaches, which proceed to London from all parts of the kingdom, regulate their movements so as to arrive by six o'clock each morning, and from that time the sorters at Lombard-street are employed in preparing the letters for the different carriers waiting to receive them, who generally complete their delivery by twelve at noon.

P O S T.

Newspapers are conveyed gratis to all parts of the country, and if frivolous, vexatious, or malicious letters are sent through the medium of the post-office, upon a proper representation the money is returned; persons are also appointed to open such letters as may be directed to individuals improperly, or who cannot be found, when they are carefully inclosed in an envelope, explaining why the seal has been violated, and returned to the writer. Letters directed to any part of England may be sent without paying; or the receiver will take the postage, and the receipt, or non-payment, is explained to the carriers by marks stamped on the letter; but all letters sent out of England must be paid for on putting them into the office. Other marks, pointing out the day and hour of putting the letter into the receiver's hands, prevent the possibility of neglect without discovery; and so great is the vigilance of the officers, that though millions of money pass through the post-office, it is a very rare circumstance that dishonesty is discovered in the sorters or carriers: when an individual commits a theft of this description, he is pursued with unrelenting severity to punishment, and the office makes good the loss.

The present establishment of the general post-office for Great Britain, consists of a postmaster-general, to the duties of which station there have, for many years past, been two persons appointed, under the title of joint postmaster-general; a secretary; upwards of 150 assistants and clerks for the head letter-office in London, under the direction of a superintending president of the inland letter department; and a comptroller of the foreign-letter office. Near 600 deputy-postmasters, throughout the kingdom, act under one principal, and nine riding surveyors. There are also distinct offices and clerks; acting under an accountant-general and a receiver-general; as well as a separate establishment for the two-penny, formerly the penny-post, which, since the abolition of Mr. Palmer's appointment of surveyor and comptroller-general, has been new modelled and greatly improved in all its branches. There is likewise a postmaster-general of Scotland, with the secretary, comptroller, surveyors, and a separate establishment of all the requisite officers and clerks at Edinburgh, acting under the orders of the joint postmaster-general in London. The annual expence of management is about 150,000*l.* and the gross produce exceeds 700,000*l.* a year.

The general postmaster is not like a common carrier, and is not answerable for the loss of any money by post, nor can the country postmaster add any charge to the postage for carrying the letters out to the inhabitants of the town. The case has been several times tried and decided. A principal object in the erection of the post-office was in order to have the means of inspecting letters of individuals, and discovering attempts against the government, (see the Ordinance, 1657); and now letters may be opened by an order from a secretary of state. For this

and other purposes, there are several penalties levied upon persons carrying or sending letters by private conveyance. Letters coming by private ships from abroad, and even letters belonging to the owners, must also pass through the post-office. Many attempts have been made by postmasters in country towns to charge an halfpenny or penny each letter, on delivery at the houses in the town, above the parliamentary rates, under pretence that they were not obliged to carry letters out of the office gratis; but it has been repeatedly decided, that such demand is illegal, and that they are bound to deliver the letters to the inhabitants within the usual and established limits of the town, without any addition to the rate of postage. 5 Bur. 5709. See FRANKING, LETTER, NEWSPAPER, &c.

POST (Two-penny), a post established for the benefit of London, and other parts adjacent, whereby any letter or small parcel is speedily and safely conveyed to and from all places within the bills of mortality, or within ten miles of the city. It is now managed by the general post-office, and receiving-houses are established in most of the principal streets for the more convenient transmission of the letters.

Letters were originally conveyed by this office at the rate of one penny; but the rate has been lately raised to two-pence, and for letters off the stones the rate is three-pence. By means of this post, letters from London sent only ten miles into the country are delivered three times a day; and letters from such places are delivered either thrice or twice a day, according to the distance.

POST, a station, particularly a military station. Any place where persons are set or placed upon particular occasions may be termed a post; but the word in this view is now chiefly restricted to military operations, and means any place or situation where soldiers are stationed. Thus the detachments established in front of the army are termed the out-posts; the stations on the wings of the army are said to be the posts of honour, as being the most conspicuous and most exposed. But in the operations of a campaign, a post properly signifies any spot of ground capable of lodging soldiers, or any situation, whether fortified or not, where a body of men may make a stand and engage the enemy to advantage. The great advantages of good posts, in carrying on war, as well as the mode of securing them, are only learnt by experience.

To POST. *v. n.* (*poster*, French; from the noun.) To travel with speed (*Walsh*).

To POST. *v. a.* 1. To fix opprobriously on posts (*K. Charles*). 2. To place; to station; to fix (*Addison*). 3. To register methodically; to transcribe from one book into another. (See BOOKKEEPING.) 4. To delay; obsolete (*Shakspeare*).

POST (Francis), a painter, born at Haerlem, where he also died, 1680. He was in 1647 in the West Indies, employed most successfully in delineating the beauties and the scenery of that quarter of the globe.

POS

POSTAGE. *s.* (from *post*.) Money paid for conveyance of a letter (*Dryden*).

POSTBOY. *s.* (*post* and *boy*.) Courier; boy that rides post (*Tatler*).

To POSTDATE. *v. a.* (*post*, after, Latin, and *date*.) To date later than the real time.

POSTDILUVIAN. *a.* (*post* and *diluvium*, Latin.) Posterior to the flood (*Woodward*).

POSTDILUVIAN. *s.* (*post* and *diluvium*, Latin.) One that lived since the flood (*Grew*).

POSTER. *s.* (from *post*.) A courier; one that travels hastily (*Shakspeare*).

POSTERIOR. *a.* (*posterior*, Latin.) 1. Happening after; placed after; following. 2. Backward (*Pope*).

POSTERIOR ANNULARIS, in anatomy, an external interosseal muscle of the hand, that extends and draws the ring finger inwards.

P. INDICIS, an internal interosseal muscle of the hand, that extends the fore finger obliquely, and draws it outwards.

P. MEDII, an external interosseal muscle of the hand, that extends the middle finger, and draws it outwards.

POSTERIORES. *s.* (*posteriora*, Latin.) The hinder parts (*Swift*).

POSTERIORITY. *s.* (*posteriorité*, French; from *posterior*.) The state of being after: opposite to *priority* (*Hale*).

POSTERITY. *s.* (*posteritas*, Latin.) Succeeding generations; descendants (*Smalridge*).

POSTERN. *s.* (*posterne*, Dutch.) A small gate; a little door (*Fairfax*).

POSTEXISTENCE. *s.* (*post* and *existence*.) Future existence (*Addison*).

POSTHACKNEY. *s.* (*post* and *hackney*.) Hired posthorses (*Wotton*).

POSTHASTE. *s.* (*post* and *haste*.) Haste like that of a courier (*Hakewill*).

POSTHORSE. *s.* (*post* and *horse*.) A horse stationed for the use of couriers (*Shakspeare*).

POSTHOUSE. *s.* (*post* and *house*.) Post-office; house where letters are taken and dispatched (*Watts*).

POSTHUMOUS. *a.* (*posthumus*, Latin.) Done, had, or published after one's death (*Addison*).

POSTIC. *a.* (*posticus*, Latin.) Backward (*Brown*).

POSTIL. *s.* (*postille*, Fr. *postilla*, Lat.) Gloss; marginal notes.

To POSTIL. *v. a.* (from the noun.) To gloss; to illustrate with marginal notes (*Bacon*).

POSTILLER. *s.* (from *postil*.) One who glosses or illustrates with marginal notes (*Br.*).

POSTILION. *s.* (*postillon*, French.) 1. One who guides the first pair of a set of six horses in a coach (*Tatler*). 2. One who guides a postchaise.

POSTLIMINIOUS. *a.* (*postliminium*, Lat.) Done or contrived subsequently (*South*).

POSTMASTER. *s.* (*post* and *master*.) One who has charge of public conveyance of letters (*Spectator*).

POSTMASTER-GENERAL. *s.* He who presides over the posts or letter-carriers.

POT

POSTMERIDIAN. *a.* (*postmeridianus*, Lat.) Being in the afternoon (*Bacon*).

POSTOFFICE. *s.* (*post* and *office*.) Office where letters are delivered to the post; a post-house (*Swift*).

To POSTPONE. *v. a.* (*postpono*, Latin.) 1. To put off; to delay (*Rogers*). 2. To set in value below something else (*Locke*).

POSTSCRIPT. *s.* (*post* and *scriptum*, Lat.) The paragraph added to the end of a letter (*Addison*).

To POSTULATE. *v. a.* (*postulo*, Latin.) *postuler*, French.) To beg or assume without proof (*Brown*).

POSTULATE, in mathematics, &c. is described to be such an easy and self-evident supposition, as needs no explication or illustration to render it intelligible; as that a right line may be drawn from one point to another.

POSTULATION. *s.* (*postulatio*, Latin.) The act of supposing without proof; gratuitous assumption (*Hale*).

POSTULATORY. *a.* (from *postulate*.) 1. Assuming without proof. 2. Assumed without proof (*Bacon*).

POSTULATUM. *s.* (Latin.) Position assumed without proof (*Addison*).

POSTURE. *s.* (*posture*, French; *positura*, Latin.) 1. Place; situation (*Hale*). 2. Voluntary collocation of the parts of the body with respect to each other (*South*). 3. State; disposition (*Clarendon*).

To POSTURE. *v. a.* (from the noun.) To put in any particular place or disposition (*Grew*).

POSTUREMASTER. *s.* (*posture* and *master*.) One who teaches or practises artificial contortions of the body (*Spectator*).

PO'SY. *s.* (contracted from *poesy*.) 1. A motto on a ring (*Addison*). 2. A bunch of flowers (*Swift*).

POT. *s.* (*pot*, French; *potte*, Islandic.) 1. A vessel in which meat is boiled on the fire (*Dryden*). 2. Vessel to hold liquids (*John*). 3. Vessel made of earth (*Mortimer*). 4. A small cup (*Prior*). 5. To go to Pot. To be destroyed or devoured. A low phrase (*L'Estrange*).

To POT. *v. a.* (from the noun.) 1. To preserve seasoned in pots (*Dryden*). 2. To enclose in pots of earth (*Evelyn*).

POTABLE. *a.* (*potable*, French; *potabilis*, Latin.) Such as may be drank; drinkable (*Philips*).

POTABLENESS. *s.* Drinkableness.

POTAGER. *s.* (from *pottage*.) A porringer (*Grew*).

POTAMOGETON. Pond-weed. In botany, a genus of the class tetrandria, order tetragynia. Calyxless; petals four; styleless; seeds four. Thirteen species; almost all of them common to the streams, ponds, muddy or stagnant ditches of our own country.

POTAMON, or **POTAMO**, was a philosopher of Alexandria. He kept a middle course between the scepticism of the Pyrrhonists and the presumption of the dogmatists; but attached himself to none of the schools of philosophy.

of his time. He was the first projector of the eclectic sect; for though that mode of philosophising had been pretty common before, he was the first that attempted to institute a new sect on this principle. Diogenes Laertius relates, that not long before he wrote his *Lives of the Philosophers*, an eclectic sect, *ἐκλεκτικὴ τῆς αἵρεσις*, had been introduced by Potamo, of Alexandria, who selected tenets from every former sect. He then proceeds to quote a few particulars of his system from his eclectic institutes, respecting the principles of reasoning, and certain general topics of philosophical inquiry; from which nothing further can be learned, than that Potamo endeavoured to reconcile the precepts of Plato with those of other masters. As nothing remains concerning this philosopher besides the brief account just referred to in Laertius, an obscure passage in Suidas, and another still more obscure in Porphyry; it is probable that this attempt to institute a school upon the eclectic plan proved unsuccessful. The time when Potamo flourished is uncertain. Suidas places him under Augustus; but it is more probable, from the account of Laertius, that he began his undertaking about the close of the second century.

POTASH, in chemistry, one of the three fixed alkalies, procured from the burnt ashes of vegetables, by combustion in iron or other pots, whence the compound pot-ash. It was long distinguished by the name of vegetable alkali, in consequence of its being chiefly obtained from plants, and being at one time supposed to be peculiar to the vegetable kingdom, which is now well known to be a mistake. It was also called salt of tartar, because it may be procured by burning the salt called tartar. Mr. Kirwan has given it the name of tartarin: Klaproth has called it kali; Dr. Pearson, vegalkali; and Dr. Black, lixiva. By most British chemists it is called as above, potash; although, in common language, this last term rather signifies the carbonat of potash, or potash of commerce.

That potash was known to the ancient Gauls and Germans cannot be doubted, as they were the inventors of soap, which Pliny informs us they composed of ashes and tallow. These ashes (for he mentions the ashes of the beech-tree particularly) were nothing more than pot-ash, though not pure potash. The *noxia*, moreover, referred to by Aristophanes and Plato, appears to have been a ley made of the same kind of ashes. The alchemists were well acquainted with it; and, in every period, it has been very largely employed in chemical researches. It may with justice, however, be affirmed that till Berthollet published his process in the year 1786, chemists had never examined potash in a state of complete purity.

This substance, in its rough state, is prepared by burning wood, or other vegetable matter, and thus reducing them to ashes. The ashes are washed repeatedly with fresh waters, till the liquid comes off perfectly tasteless. The liquids thus obtained are evaporated, and the salt pro-

cured is potash. If this substance be exposed to a red heat, many of the materials which are mixed with it are driven off, and what remains is much whiter, and on account of its colour it is called pearl-ash. In this state it is deemed sufficiently pure for the ordinary purposes of life, though by no means adapted to the purposes of the experimental chemist. Even when apparently freed from all extraneous substances, it is found to possess very different properties after having been subjected to certain processes. In one state it is mild and inactive; in another extremely acrid and corrosive. In the former case it is united with carbonic acid gas, and is hence a carbonat of potash, and not pure potash. When deprived of this acid gas, it is powerful, corrosive, and highly caustic. Different methods have been proposed by different chemists to obtain this substance quite pure: we shall transcribe that given by professor Lowitz of Petersburg. He boils in an iron pot for two or three hours any quantity of potash, with double its weight of quicklime, and eight times the weight of the whole mixture of distilled or rain water. The liquor is to be set by to cool, and then filtered and evaporated, till a thick pellicle arises on the surface. It is then left quiescent till crystals are formed on it, which are crystals of extraneous salts, that are to be separated. The evaporation is to be continued, and the several pellicles removed as fast as they are formed. When the fluid ceases to boil, and no more pellicles arise, it is taken from the fire, and kept stirring till cold. It is then dissolved in double its weight of water; the solution is filtered and evaporated in a glass retort, till regular crystals begin to be deposited. When a sufficient quantity has been formed, the liquid is decanted, and the salt is re-dissolved after it is suffered to drain, in the same quantity of water. The decanted liquor is preserved in a well-closed bottle for several days, till it subsides and becomes clear. It is then re-decanted, evaporated, and crystallized again, and the process repeated as long as the crystals afford with the least quantity of water solutions that are perfectly limpid.

Potash thus obtained is a white solid substance, susceptible of crystallization in long compressed quadrangular prisms, terminating in sharp-pointed pyramids. These crystals, which are only obtained from very concentrated solutions, are soft and deliquescent. The taste is extremely acrid; and so corrosive, that it destroys the texture of the skin the moment it touches it: hence it has derived the name of caustic, and is employed in surgery under the name of potential cautery, for the purpose of opening abscesses, or destroying excrescences. Its specific gravity is about 1.7. By a similar mode to the above, pure soda may be prepared, substituting the carbonat of soda for the pearl-ash. They both possess the following properties:—1. They convert vegetable blues into a green colour. 2. They powerfully attract moisture. 3. They readily dissolve in water, and produce heat during the solution. They are not volatilized by a moderate heat, and

hence are called fixed alkalies. 4. Potash shews no disposition to unite with oxygen, neither is it altered by the action of any of the compounds into which oxygen enters, though it has a strong tendency to combine with several of these compounds. 5. It unites with none of the simple combustibles except sulphur. Carbon and hydrogen do not act upon it at all; neither does it produce any alteration in them; but it acts upon phosphorus with considerable energy.

When three parts of sulphur and one of potash are triturated together in a glass mortar the sulphur acquires a green colour, the mixture becomes hot, and exhales an alliaceous odour. It gradually attracts moisture from the air, and is totally soluble in water. When two parts of potash and one of sulphur are heated in a crucible, they melt and combine, and form a sulphuret of potash. It is of a brown colour, not unlike the liver of animals; and was hence formerly called *hepar sulphuris*, liver of sulphur; but when exposed to the air it soon becomes green, and even white. It is hard, brittle, and has a glassy fracture. Its taste is acrid, caustic, and bitter, and it leaves a brown stain upon the skin.

When sulphuret of potash is exposed to the air, or when it is moistened with water, its properties very soon change. It acquires a green colour, and exhales the odour of sulphuretted hydrogen gas, in consequence of the decomposition of the water. This new-formed substance combines with the sulphuret, and converts it into hydroguretted sulphuret of potash, which is soluble in water, and has a brownish-green colour. Hydroguretted sulphuret is capable of oxydizing, and dissolving almost all the metals.

Potash cannot be combined with phosphorus by any known method; but if the former be dissolved in water, and heated over phosphorus in a retort, the water is gradually decomposed, part of the phosphorus is converted into phosphoric acid, and a great quantity of phosphuretted hydrogen gas is emitted, which takes fire as usual, as soon as it comes in contact with the air of the atmosphere. It was by this process that Geugembre first obtained phosphuretted hydrogen gas.

It does not appear that potash is capable of uniting with azot; but it unites very readily with muriatic acid, forming muriat of potash.

It does not combine with any of the metals; but dissolves a considerable number of the metallic oxyds, and in some cases deprives them of a dose of their oxygen. Lead, tin, nichel, zinc, antimony, tellurium, afford oxyds that are chiefly soluble in this substance.

POTASSIUM, a recently discovered and very singular metal obtained by peculiar management from potash, which in modern chemistry can only be regarded as its oxyd.

For the knowledge we at present possess of the bases of the alkalies we are altogether indebted to Mr. Davy, whose most curious and important experiments upon this subject are to be found in the Philosophical Transactions for 1807 and 1808.

Till this period these substances were necessarily regarded as simple from the impossibility of decomposing them by any known methods. Yet they were long and generally suspected to be compounds, though no chemist was able to follow up and detect their elements. By many the alkaliescent principle was supposed to be nitrogen, as the acidifiable was oxygen; neither of which views are now well known to be strictly correct, and the first altogether erroneous. Morveau and Desormes published an ingenious set of experiments in which they endeavoured to prove that potash (to which these experiments were chiefly directed) was a compound of hydrogen and lime. Darracq, however, with that accuracy which has characterised most of his enquiries, soon disproved this theory, and evinced that the results obtained by Desormes and Morveau were owing, in most cases, to the impurity of the potash with which they had made their experiments; while in others they had drawn wrong inferences from mistaken resemblances.

As soon as voltaic electricity was so far rendered manageable as to be applied with very great power to chemical analyses, Mr. Davy conceived the idea of enlisting this wonderful agency into his service, with a view of endeavouring to obtain a decomposition of the alkalies; and he was the more fully induced to give a full scope and latitude to a series of experiments of this kind from observing that if a neutral substance, or a compound of an acid and an alkali, constituted a part of the voltaic circle, a decomposition of such substance was the result, the acid alone always travelling to the positive side of the chain and the alkali to the negative.

Mr. Davy, in his first attempts to decompose the alkalies, made use of the aqueous solutions, and failed. He next made use of the potash in a state of igneous fusion, which he brought within the sphere of the voltaic battery: with this also he was unsuccessful in the main point; but some brilliant phenomena were produced. The potash appeared a conductor in a high degree: a most intense light was exhibited at the negative wire, and a column of flame, which seemed to be owing to the developement of combustible matter, arose from the point of contact. Mr. Davy next tried several experiments on the electrization of potash rendered fluid by heat, with the hope of being able to collect the combustible matter, but he was still unsuccessful, "and I only," says he, "attained my object by employing electricity as the common agent for fusion and decomposition." Potash perfectly dried by ignition is a non-conductor; by a very slight addition of moisture, which does not perceptibly destroy its aggregation, it is rendered a conductor, and in this state it readily fuses and decomposes by strong electrical powers. A small piece of pure potash was placed upon an insulated disc of platina, connected with the negative side of the battery, in a state of intense activity; and a platina wire, communicating with the positive side, was brought in contact with the upper surface of the alkali, a vivid action took place, and the potash began to fuse at both points of electrization. There was a violent effervescence at the upper surface; at the lower, or negative surface, there was no liberation of elastic fluid; but small globules, having a high metallic lustre, appeared; these were similar in visible character to quicksilver: some of them burnt with explosion and bright flame as soon as they were produced, and others

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remained, and were merely tarnished, and finally covered with a white film, which formed on them. "These globules," said Mr. Davy, "numerous experiments soon shewed to be the substance I was in search of, and a peculiar inflammable principle the basis of potash. I found that the platina was in no way connected with the result, except as the medium for exhibiting the electrical powers of decomposition; and a substance of the same kind was produced when pieces of copper, silver, gold, plumbago, or even charcoal, were employed for completing the circuit."

Soda, when acted upon in the same manner, exhibited an analogous result, and these effects equally took place in the atmosphere, and when the alkali was acted upon in the vacuum of an exhausted receiver; but these globules could not in either case be produced from crystallized alkalies. When a globule of the base of potash was exposed to the atmosphere, it immediately attracted oxygen, and a white crust formed upon it, which proved to be pure potash. When the globules were strongly heated and then suspended in oxygen gas, a rapid combustion with a brilliant white flame was produced, and these metallic globules were converted to an alkali, whose weight greatly exceeded that of the combustible matter consumed. When Mr. Davy had thus detected the basis of the fixed alkalies, he had considerable difficulty to preserve and confine them, so as to examine their properties and submit them to experiments. He found, however, at length, that in recently distilled naphtha they may be preserved many days, and that their physical properties may be easily examined in the atmosphere, when they are covered by a thin film of it. Potassium at 60° Fahrenheit is only imperfectly fluid; at 70° it becomes more fluid; and at 100° its fluidity is perfect, so that different globules may be easily made to run into one. At 50° it becomes a soft and malleable solid, which has the lustre of polished silver; and at about the freezing point of water it becomes harder and brittle, and when broken in fragments exhibits a crystallized texture, of perfect whiteness and high metallic splendour. To be converted into vapour, it requires a temperature approaching that of the red heat. It is an excellent conductor of heat, and a perfect conductor of electricity.

Resembling the metals in all these properties, it is, however, remarkably different from any of them in specific gravity; for it will not sink in double distilled naphtha, whose specific gravity is only .770, that of water being considered as 1.000. Mr. Davy has determined by experiment that its specific gravity is to that of mercury as 10 to 223, which gives a proportion to that of water nearly as 6 to 10; so that it is the lightest fluid body known. When this substance is introduced into oxymuriatic acid gas, it burns spontaneously with a bright red light, and muriat of potash is formed. When thrown upon water, it decomposes it with great violence, and an instantaneous explosion is produced with brilliant flame, and a solution of pure potash is the result.

When a globule is placed upon ice, not even the solid form of the two substances can prevent their union; for it instantly burns with a bright flame, and a deep hole is made in the ice, which is found to contain a solution of potash. When a globule is dropped upon moistened turmeric paper, it immediately burns and moves rapidly upon the paper, as if in search of moisture, leaving behind

it a deep reddish brown trace. So strong is the attraction of this basis of potash for oxygen, that it discovers and decomposes the small quantities of water contained in alcohol and ether, even when they are carefully purified. When thrown into the mineral acids, it inflames and burns on the surface. In sulphuric acid, sulphat of potash is formed; in nitrous acid, nitrous gas is disengaged, and nitrat of potash formed. When brought in contact with a piece of phosphorus, and pressed upon, there is a considerable action; they become fluid together, burn, and produce phosphat of potash. When a globule is made to touch a globule of mercury about twice as large, they combine with considerable heat; the compound is fluid at the temperature of its formation: but when cool it appears as a solid metal, similar in colour to silver. If this compound be exposed to air, it rapidly absorbs oxygen; potash which deliquesces is formed; and in a few minutes the mercury is found pure and unaltered.

When a globule of the amalgam is thrown into water, it rapidly decomposes it with a hissing noise, potash is formed, hydrogen disengaged, and the mercury remains free. The basis of potash readily reduces metallic oxys when heated in contact with them. It decomposes common glass by a gentle heat, and at a red heat effects a change even in the purest glass.

Mr. Davy has discovered that sodium or the base of soda, like that of potash, is white, opaque, and has the lustre of silver. The property of welding, which belongs to iron and platina, at a white heat only, is possessed by this substance at common temperatures. It is very similar, in its more obvious properties, to the base of potash; but it has greater specific gravity, being to that of water nearly as nine to ten, or as .9348 to 1.0000. In oxygen gas it produces a white flame, and sends forth bright sparks, occasioning a very beautiful effect. In oxymuriatic gas it burns vividly, with numerous scintillations of a bright red colour. In the quantity of $\frac{1}{100}$, it renders mercury a fixed solid, of the colour of silver, and forms an alloy with tin. When amalgamated with mercury, the amalgam will combine with other metals.

Mr. Davy tried this with iron and platina, and had reason to believe that these latter metals remain in combination with the mercury, even when deprived of the new substance by exposure to the air. From several curious and ingenious experiments to ascertain the proportions of the bases and oxygen in the two fixed alkalies, he concludes that 100 parts of potash consist of about 84 basis, and 16 oxygen; and 100 parts of soda consist of about 76 or 77 basis, and 24 or 23 oxygen; or that potash may be considered as consisting of about 6 parts basis, and 1 of oxygen; and soda of 7 basis, and 2 oxygen. In reply to the question, whether the bases of potash and soda should be called metals, it may be said that they agree with metals in opacity, lustre, malleability, conducting powers as to heat and electricity, and in their qualities of chemical combination. Even their low specific gravity does not appear a sufficient reason for making them a new class; for amongst the metals themselves there are remarkable differences in this respect, platina being nearly four times as heavy as tellurium; while tellurium is not much more than six times as heavy as the basis of soda. Conceiving the basis of the two fixed alkalies to be metals, Mr. Davy has named one potassium, and the other sodium; adopting

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that neutral termination which, by common consent, has been applied to other newly discovered metals.

On an examination of the volatile alkali, and after a great number of complex and tedious experiments, Mr. Davy saw reason to conclude that ammonia contains oxygen as an essential ingredient, and that this cannot well be estimated at less than 7 or 8 parts in the hundred: this body may, therefore, in his opinion, be considered as the principle of alkaliescence, with as much reason as the French have made it the principle of acidity. After making some general remarks on the preceding facts, he suggests the probability that the muriatic, fluoric, and boric acids all contain oxygen as one of their constituent principles. The earths of barytes and strontian, as being most analogous to the alkalies, were likewise examined, and both yielded oxygen. In concluding this very important communication, Mr. Davy remarks that an immense variety of objects of research is presented in the powers and affinities of the new metals produced from the alkalies. In themselves, they will undoubtedly prove powerful agents for analysis; and having an affinity for oxygen, stronger than any other known substances, they may possibly supersede the application of electricity to some of the undecomposed bodies. At any rate to use the words of the professor himself: "In sciences kindred to chemistry, the knowledge of the nature of the alkalies, and the analogies arising in consequence, will open many new views; they may lead to the solution of many problems in geology, and show that agents may have operated in the formation of rocks and earths, which have not hitherto been suspected to exist."

M. M. Gay Lussac and Thenard have since discovered that potassium may be obtained much more readily and in larger quantities by the simple action of ignited iron upon potash, which separates the oxygen as effectually as the voltaic circuit. Hence these chemists conceived, and at first strongly asserted, that potassium, instead of being a simple substance, is a compound of potash and hydrogen, the last being obtained from the iron. They have since, however, been sufficiently convinced by other experiments of Mr. Davy's and of their own, and have liberally acknowledged their error.

In various subsequent papers introduced into the Philosophical Transactions this able indagator has pressed the same or similar trains of experiments into the different kinds of earths, and although by no means with equal success, with great ingenuity and many valuable elucidations. The general result of the whole appears to be as follows.

It seems to be sufficiently proved that the fixed alkalies and the alkaline earths are metallic oxys; and the proportion of their bases are nearly as well ascertained as those of several metals known for ages to philosophers, and in common life. That alumine, zircon, glucine, and silex are also metallic oxys, seems highly probable; but their decomposition has not yet been so completely ascertained as to render this point altogether certain; while, as to the metals which, in this case, constitute their bases, we can scarcely be said to have precisely discovered any thing. It is demonstrated that ammonia is a compound of oxygen with hydrogen and nitrogen; and that when the oxygen is removed the hydrogen and nitrogen are capable of entering into a true che-

mical union with mercury, forming a substance peculiarly similar to the amalgams of that body with other metals. It is very probable that the hydrogen and nitrogen are combined as a chemical compound which thus unites with mercury, and that the same compound unites with oxygen to form ammonia. The appearance of amalgamation as well as the analogy of the other alkaline bodies, leads us to suspect that this compound basis is truly of a metallic nature; and that the volatile like the fixed alkalies, and the alkaline earths, is a metallic oxyd: but this basis has not yet been separately exhibited.

Such, in general, is the state of our knowledge upon the constitution of the alkalies and the earths, as extended by the late wonderful discoveries: and such is the line to be drawn between what we have strictly learned as physical truths, and what we have been taught to conjecture upon evidence of a lower nature than that of legitimate induction.

The last of these wonders, the constitution of ammonia, gives rise to various hypotheses. To account for the phenomena of amalgamation with mercury and of reproduction of the alkali, three different theories have been stated. Mr. Davy himself seems to think it possible that hydrogen and nitrogen are both metals, aeriform at common temperatures, as zinc and mercury are when ignited. M. Berzelius suggests that they may be simple bodies not metallic, but forming a metal when united without oxygen, and an alkali when united and oxygenated. Mr. Cavendish submitted a third conjecture, which was that these gasses, in their common form, may be oxys, which when further oxygenated may become metallic.

The singular facts which abound in the decomposition of ammonia appear to strike Mr. Davy as capable of leading to some degree of scepticism respecting the phlogistic and antiphlogistic theories: but he clearly shows that they leave the latter in a much better state than the former. He sees some difficulty in reconciling them to either; but far more difficulty in adjusting them with the former. "If," says he, "we assume the phlogistic hypothesis, then we must assume that nitrogen by combining with one-fourth of its weight of hydrogen can form an alkali, and by combining with one-twelfth more can become metallic. If we reason on the antiphlogistic hypothesis, we must assert that though nitrogen has a weaker affinity for oxygen than hydrogen has, yet a compound of hydrogen and nitrogen is capable of decomposing water." He proceeds to show that the latter difficulty is the lesser one, and though he thinks it cannot be wholly removed, it may yet be diminished by chemical analogies; as for example, by the superior inflammability of certain compounds and the greater oxydability of alloys.

In the formation of an amalgam with ammonia and mercury, the following are very curious facts.

First, mercury is rendered solid by a combination with about $\frac{1}{13500}$ part of its weight of new matter, while its specific gravity is diminished from 13.5 to less than 3, and it retains all its metallic characters, colour, lustre, opacity, and conducting power.

Secondly, it is scarcely possible to conceive that the substance thus producing the amalgam is not metallic in its own nature; yet if so, the hydrogen and nitrogen (as Mr. Davy argues in a subsequent article) must be metallic.

In the Phil. Trans. for 1809, part I. the same subject is again pursued through a variety of ex-

periments on sulphur, phosphorus, carbon, diamond, boracic, fluoric and muriatic acids: for his ultimate views with regard to the last, the reader must turn to our article OXYMURIATIC ACID. In regard to the rest, Mr. Davy thinks he traces the decomposition and formation of nitrogen and perhaps of hydrogen in most of them: he has decomposed most of these, but not all: and the general result of his opinions in this paper, is that all matter is resolvable into metallic or oxygenous substances. The supposed simplicity, however, of the oxymuriatic acid or chlorine had not at this time been ascertained or pursued; this, at least, if it should hold its ground, will give us a third substance.

POTATION. *s.* (*potatio*, Lat.) 1. Drinking bout. 2. Draught (*Shakspeare*). 3. Species of drink (*Shakspeare*).

POTATOE, in botany. See **SOLANUM**.

POTATOES (Canada). See **HELVANTHUS**.

POTATOES (Spanish), a species of **CONVOLVULUS**, which see.

POTATOE BREAD. See **BREAD**.

POTBELLIED. *a.* (*pot* and *belly*.) Having a swollen paunch.

POTBELLY. *s.* (*pot* and *belly*.) A swelling paunch (*Arbutnot*).

TO POTCH. *v. a.* (*pocher*, French.) 1. To thrust; to push (*Shakspeare*). 2. (*pocher*, French.) To poach; to boil slightly (*Wise-man*).

POTCOMPANION. *s.* A fellow-drinker; a good fellow at carousals.

POTENCY. *s.* (*potentia*, Lat.) 1. Power; influence (*Shakspeare*). 2. Efficacy; strength (*Shakspeare*).

POTENGER (John), an English writer, born at Winchester, in 1647. He took the degree of B. A. in Corpus Christi college, Oxford, and entering the temple was called to the bar. He is chiefly known by his Pastoral Reflection on Death, a poem; and The Life of Agricola, from Tacitus. He died, in retirement, at Dorchester, in 1733.

POTENT. *a.* (*potens*, Latin.) 1. Powerful; forcible; strong; efficacious (*Shakspeare*). 2. Having great authority or dominion: as, *potent* monarchs.

POTENTATE. *s.* (*potentat*, Fr.) Monarch; prince; sovereign (*Daniel*).

POTENTIAL. *a.* (*potenciel*, Fr. *potentialis*, Lat.) 1. Existing in possibility, not in act (*Raleigh*). 2. Having the effect without the external actual property (*Shakspeare*). 3. Efficacious; powerful: not in use (*Shakspeare*). 4. In grammar, *potential* is a mood denoting the possibility of doing any action.

POTENTIAL CAUTERY, in medicine, the consuming or reducing to an eschar, any part of the human body by a caustic or metallic salt, &c. instead of a red-hot iron, which last is called the actual cautery.

POTENTIAL, in grammar, an epithet applied to one of the moods of verbs. The *potential* is the same in form with the subjunctive, and is, according to Ruddiman, implied in that mood, for which reason that grammarian rejects it; but others will have it to differ

from the subjunctive in this, that it always implies in it either *possum*, *volo*, or *debeo*. It is sometimes called the permissive mood, because it often implies a permission or concession to do a thing. See **GRAMMAR**.

POTENTIALITY. *s.* (from *potential*.) Possibility; not actuality (*Taylor*).

POTENTIALLY. *ad.* (from *potential*.) 1. In power or possibility; not in act, or positively (*Bentley*). 2. In efficacy; not in actuality (*Boyle*).

POTENTILLA. Cinquefoil: wild-tansy: silver-weed. In botany, a genus of the class icosandria, order polygynia. Calyx ten-cleft, inferior; petals five; seeds roundish, naked, mostly wrinkled, affixed to a small juiceless receptacle. Forty-one species; a few American, the rest European plants; which may be thus subdivided.

A. Leaves pinnate.

B. Leaves in finger-like divisions.

C. Leaves ternate.

The following are cultivated.

1. *P. fruticosa*. Shrubby cinquefoil. Stem erect, bark brown, about three or four feet high; leaves pinnate, alternate: flowers terminal, solitary, peduncled, of a bright yellow or golden colour, highly ornamental. A native of Oeland, England, and Siberia; flowers with us in June and July; and, like the plane-trees, has the extraordinary property of exfoliating its cuticle every year.

2. *P. fragarioides*. Strawberry-leaved cinquefoil. Root tuberous; leaves pinnate and ternate; runners creeping. A native of Siberia.

3. *P. recta*. Upright cinquefoil. Leaves seven and five, lanceolate, coarsely toothed; petals inversely heartshaped, larger than the calyx; stem erect. A native of the south of Europe; flowers in June and July.

4. *P. Monspeliensis*. Montpellier cinquefoil. Leaves ternate; stem branched, erect, about a foot high; peduncles springing out above the joints: flowers white and large, appearing in June. A native of Montpellier.

5. *P. grandiflora*. Great-flowered cinquefoil. Leaves ternate, toothed, a little hairy, and of the same colour on both sides; stem decumbent, longer than the leaves; flowers larger than in the last; appears in July. A native of Switzerland and Siberia.

The first sort may be propagated by suckers, layers, and cuttings; all the rest succeed best by parting the roots or sowing the seeds.

POTENTLY. *ad.* (from *potent*.) Powerfully; forcibly (*Bacon*).

POTENTNESS. *s.* (from *potent*.) Powerfulness; might; power.

POTERIUM. Burnet. In botany, a genus of the class monœcia, order hexandria. Calyx four-leaved; corol four-parted. Male: filaments from thirty to fifty, very long, flaccid. Female: pistil one or two; nut two-celled, coated with the hardened tube of the corol. Five species: Europe and Barbary. The following are cultivated.

1. *P. sanguisorba*. Lesser upland, or com-

mon garden burnet. Found wild on our own dry mountains, and used as a salad herb for winter and spring, from the aromatic warmth of its leaves: root and root-leaves perennial; stalk annual.

2. *P. hybridum*. Sweet burnet. A biennial plant; indigenous to the south of France, Italy, and Barbary.

3. *P. spinosum*. Prickly shrubby burnet. Armed with sharp spines; rises three feet high. A native of the Levant.

The two first should be raised by seeds or parting the roots; the second succeeds best by cuttings.

POTGUN. *s.* A gun which makes a small smart noise. Properly *popgun* (*Swift*).

POTHANGER. *s.* (*pot and hanger*.) Hook or branch on which the pot is hung over the fire.

POTHECARY. *s.* (from *apothecary*.) One who compounds and sells physic.

POTHER. *s.* (*poudre*, French, dust.) 1. Bustle; tumult; flutter (*Guardian*). 2. Suffocating cloud (*Drayton*).

To POTHER. *v. n.* To make a blustering ineffectual effort.

To POTHER. *v. a.* To turmoil; to puzzle (*Locke*).

POTHERB. *s.* (*pot and herb*.) An herb fit for the pot (*Dryden*).

POTHOOK. *s.* (*pot and hook*.) 1. Hooks for fasten pots or kettles with. 2. Ill-formed or scawled letters or characters (*Dryden*).

POTHOS, in botany, a genus of the class tetrandria, order monogynia. Spathe; spadix simple, covered with flowers; calyxless; petals four; berry two-seeded. Twelve species; natives of either of the Indies or South America.

POTIDÆA, a town of Macedonia, situate in the peninsula of Pallene. It became tributary to the Athenians, from whom Philip of Macedonia took it. The conqueror gave it to the Olynthians to render them more attached to his interest. Cassander repaired it, and called it Cassandria, a name which it still preserves.

POTION. *s.* (*potion*, Fr. *potio*, Latin.) A draught; commonly a physical draught (*Wotton*).

POTLID. *s.* (*pot and lid*.) The cover of a pot (*Derham*).

POTOMAC, or PATOMAC, a river of Virginia, which falls into the bay of Chesapeake. On the banks of this river is now erecting the city of Washington, the intended metropolis of the United States. See WASHINGTON.

POTOSI, a rich and populous town of Peru, in the audience of Los Charcos. Here is the best silver mine in all America, in a mountain in the form of a sugar-loaf. Silver was as common in this place as iron is in Europe; but it is almost exhausted, or at least little is got in comparison of what was formerly; and the mountain itself is said to be little better than a shell. The country around is so naked and barren, that the inhabitants get their provisions from the neighbouring pro-

vinces. It is seated at the bottom of the mountain of Potosi, 300 miles S.E. of Arica. Lon. 64. 25 W. Lat. 19. 40 S.

POTSDAM, a city of Upper Saxony, in the middle marche of Brandenburg, with a palace belonging to the king of Prussia. It is seated in an island 10 miles in circumference, formed by the rivers Spree and Havel, and is the most elegant and singular city in Europe. Many new houses, on the finest ancient and modern plans, were raised by Frederic II. and presented to the inhabitants; and the various public buildings display at once great magnificence and taste. In 1795, the beautiful church of St. Nicholas, in the palace-square, was destroyed by fire, together with the surrounding houses, toward which the wind directed the flames. It is 12 miles W. of Berlin. Lon. 13. 46 E. Lat. 52. 52 N.

POTSHERD. *s.* (*pot and sherd*.) A fragment of a broken pot.

POTSTONE. (*topfstein*, German; *pierre ollaire*, Fr.) In mineralogy, a genus of argillaceous earths, somewhat similar to pipe-clay, found in mass of a greenish-grey hue, its internal lustre being glistening and pearly; its fracture curved, foliated and imperfectly slaty; with tabular fragments. It is often translucent on the edges; is soft and greasy to the touch, tough and difficultly refrangible. It is found in beds with serpentine, at Como in the Grison country, and in Saxony. It may be turned in a lathe, and is worked into a variety of vessels. It is also used as a lining for furnaces, being remarkably refractory.

POTT (Percival), an English surgeon, born at London in 1713. At the age of 16 he was bound apprentice to Mr. Nourse, a surgeon of eminence, under whom he made great progress. In 1746 he was elected surgeon to St. Bartholomew's hospital. In 1757 he wrote an account of the Hernia congenita, and next year, *Observations on the fistula lachrymalis*. In 1760 he published a work on wounds and contusions of the head; and in 1764 was elected a fellow of the royal society. The profession is greatly indebted to him for the improvements he has introduced into practice. He died in 1788.

POTTAGE. *s.* (*potage*, Fr. from *pot*.) Any thing boiled or decocted for food (*Genesis*).

POTTER. *s.* (*potier*, Fr. from *pot*.) A maker of earthen vessels (*Mortimer*).

POTTER (Christopher), an English divine, born in Westmorland about 1591. He was of Queen's college, Oxford, and took his degrees in arts and divinity; and in 1626 became provost of his college. In 1635 he was made dean of Worcester, and in 1640 became vice-chancellor of Oxford. He suffered during the civil wars for his attachment to the royal cause, and died in 1646.

POTTER (Paul), or POTER, a Dutch painter, born at Enckuysen in 1625, and died at Amsterdam in 1654. He surpassed most of his profession in the representation of a bright sun upon rural scenery.

POTTER (John), archbishop of Canterbury,

was born at Wakefield in Yorkshire, in 1674. At nineteen he published his *Variantes lectiones et notæ ad Plutarchi, &c.* and the year after was chosen fellow of Lincoln college. In 1697 he published the first vol. of his *Antiquities of Greece*, and this literary pursuit engaged him in a correspondence with Grævius and other learned men abroad. In 1715 he was made bishop of Oxford, and in 1737 he succeeded Dr. Wake in the archbishopric of Canterbury. He died suddenly in 1747. He published an edition of *Lycopipon*, a discourse on church government, &c.

POTTER'S CLAY, in mineralogy. See **ARGIL**.

POTTERY: the art by which plastic earth, more or less simple, is converted into hard brittle vessels of various kinds and forms, and designed for various purposes.

The essential material of pottery is clay, which alone possesses the two requisite qualities of being in its natural state so plastic that with water it becomes a soft uniformly extensible mass, capable of assuming and retaining any form; and when thoroughly dried, and having undergone a red heat for a time, of losing this plasticity, becoming irretentive of water to any considerable degree, hard, close in texture, and able more or less perfectly to confine all liquids contained within its hollow.

Clay, however, as we have already observed in the article **ARGIL**, is in all instances a very compound substance: it owes its plasticity to alumine, which forms a constituent part of it; but the proportion of alumine varies considerably in different species, and almost as much as the other substances with which it is combined.

It may hence be supposed that many of the impure coloured natural clays are of themselves sufficiently mixed with other earths for the potter's use without any addition; but the white and finer clays mostly require dilution with silex in some form or other, which may be done to a considerable extent without taking away the plasticity requisite for working.

The most important circumstances requisite to be considered in selecting the materials for pottery are plasticity, contractility, solidity, and compactness after drying, colour, and fusibility.

The plasticity seems to be simply owing to the proportion of clay used, or relatively to the original plasticity of the clay itself; for all clays are not equally plastic, and the super-added substances in no instance increase this property, and in many cases considerably diminish it.

The texture, including the qualities of hardness and compactness, depends partly on the mixture of siliceous (flinty or sandy) ingredients with the clay, and partly on the heat employed in the burning of the pottery. The purer natural clays are almost infusible in any furnace heat; their hardness is nearly progressive with the intensity of the fire, but they have the essential defects of drying very slowly, of shrinking very considerably, and of becoming rifty

or full of minute cracks when dried, so as on this account to be porous. It is therefore necessary to mix them intimately with any other earth of qualities opposite to those of clay; that is, which absorbs but little water, and quickly parts with it, (qualities directly opposite to plasticity) and which dries compact and close.

The colour of the earths used is also of essential importance in the finer pottery, in which the great desideratum is to find a clay which after burning remains perfectly white. The appearance before burning cannot always be depended upon; for though in general the whitest clays before burning are those that remain white afterwards, it is only in a few districts that clays are to be found that retain a perfect whiteness. Thus there exists at the foot of a range of high hills that directly overlook the Staffordshire potteries, a stratum of white clay to appearance fully equal if not superior to the best Devonshire clays, which cannot be employed for fine pottery, from its acquiring in burning a yellowish cream colour which no art can correct. This colour is supposed to depend on an intermixture of iron.

The fusibility of clays and of other pottery earths is a subject of extreme importance, as it is this property that principally constitutes the difference between common pottery and porcelain.

We have defined porcelain to be a species of pottery ware composed of an earthy mixture which resists complete fusion in a very considerable heat, but has been brought by a less heat than its melting point to a state of incipient fusion, and is thereby rendered extremely hard, sonorous, and semi-transparent, and possesses a semi-conchoidal splintery fracture approaching to the vitreous, which is completely conchoidal. This last is quite a distinctive character between porcelain and pottery, for the fracture of pottery is extremely granular; and hence porcelain may correctly be regarded as a substance of a middle nature between pottery and glass.

From these circumstances it appears probable that no chemical action takes place in any pottery combination till it arrives at the state of porcelain. The most perfect and beautiful porcelains of Japan and China are composed of two distinct earths; one in which silex predominates, and which melts in a strong fire; and another which is infusible *per se*: and by the union of those two earths a porcelain is produced which scarcely vitrifies at the utmost furnace heat which art can excite. This substance possesses the combined excellencies of great hardness, beautiful semi-transparency, exquisite whiteness, where not artificially coloured, strong toughness and cohesion; so that it has strength enough for the purposes for which it is designed when made very thin, and bears sudden heating and cooling without cracking.

Of the beautiful European porcelains which have been made in imitation of the oriental, it does not appear that any of them unite all

POTTERY.

its excellencies. Earthy combinations have been made equally strong, tough, and infusible, and as truly porcelainous when burnt, but they have not quite rivalled the best Japanese in delicate whiteness and lustre. As these last qualities, however, are esteemed most essential, that of infusibility (which indeed is of no great consequence for any of the common uses of porcelain) has been sacrificed; and hence those that make a near approach to the oriental in beauty and delicate lustre, of which many manufactures in different parts of Europe have afforded splendid examples, are frequently found to soften and melt down in an intense heat of a wind-furnace, at which the true Nankin and Japan china undergo no change.

The manufacture of the ordinary pottery is on the whole very simple where a due selection of materials is made; but the ornamental branches of it, such as those of modelling, enamelling, painting, and gilding, which often display exquisite beauty, are accompanied with much delicacy, and require a combination of perseverance, skill, and practical nicety of management, that are rarely equalled in any other chemical manufacture.

An intimate mixture of the ingredients used in pottery is of great importance to the beauty, compactness, and soundness of the ware. Formerly the wet clay and ground flint, or whatever else was employed, were beaten together with long-continued manual labour, no more water being added than was necessary to render the clay thoroughly plastic. This laborious and expensive method has now been laid aside in the larger potteries; and the ingenious method has been substituted of bringing each material first to an impalpable powder, and diffusing them separately in as much water as will bring them to the consistence of thick cream, mixing them in due proportion by measure, and when thoroughly stirred together, evaporating the superfluous water till the mass is brought to a proper consistence for working.

In the Staffordshire process the materials are a fine clay, brought chiefly from Devonshire, and a siliceous stone called chert, or else common flint reduced to powder by heating it red-hot, quenching it in water, and then grinding it by windmills. Each material is passed through fine brass sieves, then diffused in water, mixed by measure, and brought to a plastic state as above.

The wheel and lathe are the chief, and almost the only, instruments made use of: the first for large works, and the last for small. The potter's wheel consists principally in the nut, which is a beam or axis, whose foot or pivot plays perpendicularly on a free-stone sole or bottom. From the four corners of this beam, which does not exceed two feet in height, arise four iron bars, called the spokes of the wheel; which, forming diagonal lines with the beam, descend, and are fastened at bottom to the edges of a strong wooden circle, four feet in diameter, perfectly like the felloe of a coach-wheel, ex-

cept that it has neither axis nor radii, and is only joined to the beam, which serves it as an axis, by the iron bars. The top of the nut is flat, of a circular figure, and a foot in diameter: and on this is laid the clay which is to be turned and fashioned. The wheel, thus disposed, is encompassed with four sides of four different pieces of wood fastened on a wooden frame; the hind-piece, which is that on which the workman sits, is made a little inclining towards the wheel; on the fore-piece are placed the prepared earth; on the side-pieces he rests his feet, and these are made inclining, to give him more or less room. Having prepared the earth, the potter lays a round piece of it on the circular head of the nut, and sitting down, turns the wheel with his feet till it has got the proper velocity; then, wetting his hands with water, he presses his fist or his fingers-ends into the middle of the lump, and thus forms the cavity of the vessel, continuing to widen it from the middle; and thus turning the inside into form with one hand, while he proportions the outside with the other, the wheel constantly turning all the while, and he wetting his hands from time to time. When the vessel is too thick, he uses a flat piece of iron, somewhat sharp on the edge, to pare off what is redundant; and when it is finished, it is taken off from the circular head, by a wire passed underneath the vessel.

The potter's lathe is also a kind of wheel, but more simple and slight than the former; its three chief members are an iron beam or axis three feet and a half high, and two feet and a half diameter, placed horizontally at the top of the beam, and serving to form the vessel upon: and another large wooden wheel, all of a piece, three inches thick, and two or three feet broad, fastened to the same beam at the bottom, and parallel to the horizon. The beam or axis turns by a pivot at the bottom in an iron stand. The workman gives the motion to the lathe with his feet, by pushing the great wheel alternately with each foot, still giving it a greater or lesser degree of motion, as his work requires. They work with the lathe, with the same instruments, and after the same manner, as with the wheel. The mouldings are formed by holding a piece of wood or iron, cut in the form of the moulding, to the vessel, while the wheel is turning round, but the feet and handles are made by themselves, and set on with the hand; and if there be any sculpture in the work, it is usually done in wooden moulds, and stuck on piece by piece on the outside of the vessel.

Handles, spouts, &c. are afterwards fixed on to the moulded piece if required; and it is then set to dry for some days in a warm room, where it becomes so hard as to bear handling without altering its shape. When dry enough it is inclosed along with many others in baked clay cases of the shape of bandboxes, called seggars, which are made of the coarse clays of the country. These are next ranged in the kiln or furnace so as to fill it except a space in the

middle for the fuel. Here the ware is baked till it has remained fully red hot for a considerable time, which in the larger kilns consumes ten or fifteen tons of coals: after which the fire is allowed to go out, and when all is cooled, the seggars are taken out, and their contents unpacked.

The ware is now in a state of biscuit, perfectly void of gloss, and resembling a clean egg-shell. In order to glaze it, which is the next process, the biscuit ware is dipped in a tub containing a mixture of about sixty parts of litharge, ten of clay, and twenty of ground flint, diffused in water to a creamy consistence, and when taken out, enough adheres to the piece to give an uniform glazing, when again heated: for which purpose the pieces are re-packed up in the seggars, with small bits of pottery interposed between each, and fixed in the kiln as before. The glazing mixture fuses at a very moderate heat, and gives an uniform glossy coating, which finishes the process for common white ware; though the painting and gilding require subsequent attention.

POTTING. *s.* (from *pot.*) Drinking (*Shakespeare*).

POTTLE. *s.* (from *pot.*) A liquid measure containing four pints (*Ben Jonson*).

In London it denotes a little tapering basket, for strawberries and other delicate fruits, but of no precise dimensions.

POTTON, a town in Bedfordshire, with a market on Saturday, 12 miles E. of Bedford, and 48 N. by W. of London. Lon. O. 18 W. Lat. 52. 11 N.

POTVALIANT. *a.* (*pot* and *valiant.*) Heated to courage by strong drink.

POTULENT. *a.* (*potulentus*, Latin.) 1. Pretty much in drink. 2. Fit to drink.

POUCH. *s.* (*poche*, French.) 1. A small bag; a pocket (*Sharp*). 2. Applied ludicrously to a big belly, or paunch.

To POUCH. *v. a.* 1. To pocket (*Tusser*). 2. To swallow (*Derham*). 3. To pout; to hang down the lip (*Ainsworth*).

POUCH, in botany. See **SILICLE**.

POUCHMOUTHED. *a.* (*pouch* and *mouthed*.) Blubberlipped (*Ainsworth*).

POVERTY. *s.* (*pauvreté*, French.) 1. Indigence; necessity; want of riches (*Shakespeare*). 2. Meanness; defect (*Bacon*).

POUGET (Francis Amé), a French priest of the oratory, and doctor of the Sorbonne, born at Montpellier in 1666. He was vicar of St. Roch at Paris in 1692, and in that office was said to have converted the celebrated La Fontaine; on which subject he wrote a curious letter published by Desmolets. Colbert, bishop of Montpellier, placed him at the head of a seminary in that town; from which he returned to the capital, where he died in 1723.

POULDAVIS. [*s.* A sort of sail-cloth (*Ainsworth*).

POULT. *s.* (*poulet*, Fr.) A young chicken.

POULTERER. *s.* (from *poult.*) One whose trade is to sell fowls ready for the cook (*Har.*).

POULTICE. *s.* (*pultis*, Latin.) A cataplasm; a soft mollifying application. See **CATAPLASM**.

To POULTICE. *v. a.* (from the noun.) To apply a poultice or cataplasm.

POULTIVE. *s.* A poultice (*Temple*).

POULTRY. *s.* (*poulet*, French.) Domestic fowls (*Dryden*).

POUNCE, the pounded resinous tears of the juniperus communis. See **SANDRAC**.

POUNCE, is also a little heap of charcoal dust, inclosed in a piece of muslin or some other open stuff, to be passed over holes pricked in a work, in order to mark the lines or designs thereof on paper, silk, &c. placed underneath; which are to be afterwards finished with a pen and ink, a needle, or the like. This kind of pounce is much used by embroiderers, to transfer their patterns upon stuffs; by lace-makers, and sometimes also by engravers.

POUNCES, in falconry, the talons or claws of a bird of prey.

To POUNCE. *v. a.* (*pongonare*, Ital.) 1. To pierce; to perforate (*Bacon*). 2. To pour or sprinkle through small perforations (*Bacon*). 3. To seize with the pounces or talons.

POUNCED. *a.* (from *pounce*.) Furnished with claws or talons (*Thomson*).

POUNCETBOX. *s.* (*pounce* and *box*.) A small box perforated (*Shakespeare*).

POUND. *s.* (*pond*, *pund*, Saxon.) 1. A certain weight, consisting in troy weight of twelve, in averdupoise of sixteen ounces. 2. The sum of twenty shillings (*Peacham*). 3. (from *pin*, *an*, Sax.) A pinfold; a prison in which beasts are enclosed (*Swift*).

To POUND. *v. a.* (*punian*, Saxon.) 1. To beat; to grind as with a pestle (*Bentley*). 2. To shut up; to imprison, as in a pound (*Spectator*).

POUNDAGE. *s.* (from *pound*.) 1. A certain sum deducted from a pound (*Swift*). 2. Payment rated by the weight of the commodity (*Clarendon*).

POUNDER. *s.* (from *pound*.) 1. The name of a heavy large pear (*Swift*). 2. Any person or thing denominated from a certain number of pounds: as, a ten pounder, a gun that carries a bullet of ten pounds weight. 3. A pestle (*Ainsworth*).

POUPARTS LIGAMENT. Ligamentum Poupartii. Fallopiian ligament. Inguinal ligament. In anatomy, a strong ligament, or rather a tendinous expansion of the external oblique muscle, going across from the inferior and anterior spinous process of the ilium, to the crista of the os pubis. It is under this ligament, the femoral vessels pass; and when the intestine or omentum passes underneath it, the disease is called a femoral hernia.

POUPETON. *s.* (*poupée*, French.) A puppet or little baby.

POUPICS. *s.* In cookery, veal steaks and slices of bacon (*Bailey*).

To POUR. *v. a.* (*burw*, Welsh.) 1. To let some liquid out of a vessel, or into some place

POU

or receptacle (*Exodus*). 2. To emit; to give vent to; to send forth; to let out; to send in a continued course (*Dup.*).

To **POUR**. *v. n.* 1. To stream; to flow. 2. To rush tumultuously (*Pope*).

POURBUS (Peter and Francis), father and son, two Flemish painters of the 16th century. There are some good pictures of the son in the town-house at Paris. The father died at Antwerp in 1580, and the son at Paris in 1622.

POURER. *s.* (from *pour*.) One that pours. **POURRETIA**, in botany, a genus of the class monadelphia, order polyandria. Calyx five-parted; petals five, lanceolate; drupe dry, one-seeded, large, winged. One species; an arborescent plant of Peru.

POURSELUC, a town of the kingdom of Siam, 280 miles N. of Siam. Lon. 100. 40 E. Lat. 18. 58 N.

POURSUIVANT, or **PURSUIVANT**, in heraldry, the lowest order of officers at arms. The pursuivants are properly attendants on the heralds, when they marshal public ceremonies. Of these, in England, there were formerly many, but at present there are only four, viz. blue-mantle, rouge-cross, rouge-dragon, and portcullice. In Scotland, there is only one king at arms, who is stiled lion, and has no less than six heralds, and as many pursuivants, and a great many messengers at arms under him.

POURZAIN, a town of France, in the department of Puy de Dome, seated on the Sioule, 36 miles N. by E. of Clermont, and 190 S. of Paris. Lon. 3. 15 E. Lat. 46. 21 N.

POURVEYANCE. See **PURVEYANCE**. **POUSSE**, the old word for *pease*.

POUSSIN (Nicholas), an eminent landscape and historical painter, born at Andely in Normandy, in 1594. Inspired with the love of his art, he left his country and went to Italy, where he devoted much of his time to the study of antiques and bas reliefs. Louis XIII. invited him back to Paris, and allowed him to lodge in the Tuilleries. Louis XIV. conferred a pension on him; but the artist being thwarted in his painting the Labours of Hercules, which he began as an ornament for the gallery of the Louvre, he returned again to Rome, where he died of a palsy in 1665.

POUSSIN (Gasper), a painter whose real name was Dughet, but took that of Poussin out of regard to the art of painting, and because his sister married Nicholas Poussin. Sandrart says that Gasper was first employed only to prepare the pallet, pencils, and colours for his great master, he rose to an eminence in landscape-painting unattained by any painter whatever. In representing a land-storm he is truly admirable. He died about 1675, aged 75.

POUT. *s.* 1. A kind of fish; a codfish. 2. A kind of bird (*Carew*).

To **POUT**. *v. n.* (*bouter*, French.) 1. To look sullen by thrusting out the lips (*Shak-*

POW

speare). 2. To shoot out; to hang prominent (*Dryden*).

POZZOLANO. Pozzolino. In mineralogy, a species of **PUTEOLANA**, which see.

POWDER. *s.* (*poudre*, French.) 1. Dust; any body comminuted (*Exodus*). 2. Gunpowder (*Hayward*). See **GUNPOWDER**. 3. Sweet or scented dust for the hair (*Herbert*).

To **POWDER**. *v. a.* (from the noun.) 1. To reduce to dust; to comminute; to pound or grind small. 2. (*poudrer*, Fr.) To sprinkle, as with dust (*Donne*). 3. To salt; to sprinkle with salt (*Cleaveland*).

To **POWDER**. *v. n.* To come tumultuously and violently; a low word (*L'Estrange*).

POWDER, in pharmacy. See **PHARMACY**.

POWDERBOX. *s.* (*powder and box*.) A box in which powder for the hair is kept (*Gay*).

POWDERHORN. *s.* (*powder and horn*.) A horn case in which gunpowder is kept (*Swift*).

POWDER MAGAZINE. See **MAGAZINE**.

POWDERMILL. *s.* (*powder and mill*.) The mill in which the ingredients for gunpowder are ground and mingled (*Arbutnot*).

POWDERPROVER, or **EPROUVETTE**, an instrument contrived for the purpose of ascertaining the strength of gunpowder. There are various contrivances for this purpose, some of a more simple, and some of a more complex and expensive kind. We shall here confine ourselves to powderprovers of the former sort.

M. Regnier invented one in which a small barrel is placed vertically to hold the powder, over which a stopper is held down by a weight suspended beneath it by a cord.

The stopper is connected with a vertical ratchet wheel, with thirty teeth cut on its circumference, against which a spring catch presses; on the edge of the wheel a groove is cut to hold the cord by which the weight is sustained; a small pan for the priming projects at right angles from the barrel.

The face of the ratchet wheel is graduated with about 50 divisions, beginning from its lowest point, and the numbers ascend at the opposite side to the weight; the mark for good powder is about the 13th degree, and when the explosion forces round this mark to the catch, the powder is known to be of the quality desired; but for the greater precision, the trial is repeated several times, and the mean term taken. The apparatus described is attached to a handle, by which it is held when discharged.

In the powder-provers generally used, a coiled spring acts instead of the weight above-mentioned; and the principal advantage of the new instrument arises from its action being always uniform, while that of the old one varies, on account of the spring losing its elasticity from long continued tension.

M. Regnier invented another *eprouvette*, in which he fitted a small brass cannon (such as the children play with) to one branch of an

ingenious springweighing instrument, fitted with an index, being a piece of cloth or of leather sliding along a wire adjusted parallel to a graduated arch, and a stopper or cap to the muzzle of the piece. Then, as the powder occupies a greater space by its inflammation, it drives back the stopper, and the latter carries with it that branch of the instrument in which its tail is fastened: and that branch cannot remove with respect to the other, which is made to move also by the recoil of the little cannon, without driving before it the small index piece, which, remaining at the place to which it is thus driven, shews the comparative strength of the powder. Here the only friction in the instrument is that of the small cloth index upon its wire, which is exceedingly minute compared with that of teeth and pinions, and on the whole we prefer this, as a portable measure of powder for sportsmen, &c. to any in use.

The most ingenious and accurate eprouvette with which we are acquainted is that employed by Dr. Hutton, in his valuable experiments on gunnery: a description of this instrument may be seen in the 3d vol. of the Doctor's Tracts.

POWDER-ROOM. *s.* (*powder and room.*) The part of a ship in which the gunpowder is kept (*Waller*).

POWDER-CHESTS. *s.* Wooden triangular chests filled with gunpowder, pebble-stones, and such like materials, set on fire when a ship is boarded by an enemy.

POWDERING-TUB. *s.* (*powder and tub.*) 1. The vessel in which meat is salted (*More*). 2. The place in which an infected lecher is physiced to preserve him from putrefaction.

POWDERY. *a.* (*poudreux*, French, from *powder*.) Dusty; friable (*Woodward*).

POWELL (David), a Welch divine and antiquary, born in Denbighshire about 1552, educated at Oxford, where he took his degree of D. D. He died in 1590, and was buried in the church of Ruabon in Denbighshire, of which he was vicar. He published Caradoc's history of Wales with annotations in 1584, and some other works.

POWELL (William Samuel), an English divine, born at Colchester in 1717, and educated at St. John's college, Cambridge. He took the degree of D. D. in 1756, and in 1765 he was elected master of his college. The next year he obtained the archdeaconry of Colchester; and afterwards some valuable livings. He died in 1775, leaving to 20 friends, most of them of the college, 100l. a piece. He is the author of some sermons.

POWELL (George), an English actor who was considered as a rival of Betterton. His propensity to drinking allowed Wilkes, another rival, to surpass him in his walk. He died in 1714. He wrote *Alphonso* king of Naples, and three other pieces; and published as many from the pen of others.

POWER. *s.* (*pouvoir*, French.) 1. Command; authority; dominion; influence of

greatness (*Shakspeare*). 2. Influence; prevalence upon (*Bacon*). 3. Ability; force; reach (*Hooker*). 4. Strength; motive; force (*Locke*). 5. The moving force of an engine (*Wilkins*). 6. Animal strength; natural strength (*Bacon*). 7. Faculty of the mind (*Davies*). 8. Government; right of governing (*Milton*). 9. Sovereign; potentate (*Addison*). 10. One invested with dominion (*Davies*). 11. Divinity (*Dryden*). 12. Host; army; military force (*Knolley*). 13. A large quantity; a great number: as, a power of good things.

POWER (Muscular). See **IRRITABILITY** and **MUSCULAR MOTION**.

POWER (Tonic). See **IRRITABILITY**.

POWER, in mechanics, denotes some force which, being applied to a machine, tends to produce motion; whether it does actually produce it or not. In the former case, it is called a moving power; in the latter, a sustaining power.

POWER is also used in mechanics, for any of the six simple machines, viz. the lever, the balance, the screw, the wheel and axle, the wedge, and the pulley.

POWER OF A GLASS, in optics, is by some used for the distance between the convexity and the solar focus.

POWER, in arithmetic, the produce of a number, or other quantity, arising by multiplying it by itself, any number of times.

Any number is called the first power of itself. If it be multiplied once by itself, the product is the second power, or square; if this be multiplied by the first power again, the product is the third power, or cube; if this be multiplied by the first power again, the product is the fourth power, or biquadratic; and so on; the power being always denominated from the number which exceeds the multiplications by one or unity, which number is called the index or exponent of the power, and is now set at the upper corner towards the right of the given quantity or root, to denote or express the power. Thus,

3 or $3^1 = 3$ is the 1st power of 3,
 3×3 or $3^2 = 9$ is the 2d power of 3,
 $3^2 \times 3$ or $3^3 = 27$ is the 3d power of 3,
 $3^3 \times 3$ or $3^4 = 81$ is the 4th power of 3,
 &c. &c.

Hence, to raise a quantity to a given power or dignity, is the same as to find the product arising from its being multiplied by itself a certain number of times; for example, to raise 2 to the 3d power, is the same thing as to find the factum, or product $8 = 2 \times 2 \times 2$. The operation of raising powers, is called involution.

Powers, of the same degree, are to one another, in the ratio of the roots as manifold as their common exponent contains units: thus, squares are in a duplicate ratio of the roots; cubes in a triplicate ratio; 4th powers in a quadruplicate ratio.—And the powers of proportional quantities are also proportional to one another; so, if $a : b :: c : d$, then, in any powers also, $a^n : b^n :: c^n : d^n$.

P O W E R.

The particular names of the several powers, as introduced by the Arabians, were, square, cube, quadrato-quadratum or biquadrat, sursolid, cube squared, second sursolid, quadrato-quadrato-quadratum, cube of the cube, square of the sursolid, third sursolid, and so on, according to the products of the indices.

And the names given by Diophantus, who is followed by Vieta and Oughtred, are, the side or root, square, cube, quadrato-quadratum, quadrato-cubus, cubo-cubus, quadrato-quadrato-cubus, quadrato-cubo-cubus, cubo-cubo-cubus, &c. according to the sums of the indices.

But the moderns, after Des Cartes, are contented to distinguish most of the powers by the exponents: as 1st, 2d, 3d, 4th, &c.

The characters by which the several powers are denoted, both in the Arabic and Cartesian notation, are as follow:

Arab.	1	R	q	c	bq	s	gc	Bs	tq	bc
Cart.	a^0	a^1	a^2	a^3	a^4	a^5	a^6	a^7	a^8	a^9
	1	2	4	8	16	32	64	128	256	512

Hence, 1st. The powers of any quantity, form a series of geometrical proportionals, and their exponents a series of arithmetical proportionals, in such sort that the addition of the latter answers to the multiplication of the former, and the subtraction of the latter answers to the division of the former, &c.; or in short, that the latter, or exponents, are as the logarithms of the former, or powers.

Thus, $a^2 \times a^3 = a^5$, and $2 + 3 = 5$;

$$4 \times 8 = 32;$$

also $a^5 \div a^3 = a^2$, and $5 - 3 = 2$;

$$32 \div 8 = 4.$$

2d. The 0 power of any quantity, as a^0 , $\frac{1}{a^0} = 1$.

3d. Powers of the same quantity are multiplied, by adding their exponents: Thus,

Mult.	a^3	x^2	y^m	x^m	a^3
by	a^4	a^4	y^m	x^n	a^n
Prod.	a^7	x^6	y^{2m}	x^{m+n}	$a^3 + n$

4th. Powers are divided by subtracting their exponents. Thus,

Div.	a^7	a^6	y^{2m}	x^{m+n}	$a^3 + n$
by	a^3	a^2	y^m	x^m	a^3
Quot.	a^4	a^4	y^m	x^n	a^n

5th. Powers are also considered as negative ones, or having negative exponents, when they denote a divisor, or the denominator of a fraction. So

$$\frac{1}{a^3} = a^{-3}, \text{ and } \frac{2}{a^2} = 2a^{-2}, \text{ and } \frac{a^2}{a^4} = a^2 x^{-4},$$

&c. And hence any quantity may be changed from the denominator to the numerator, or from a divisor to a multiplier, or vice versa, by changing the sign of its exponent; and the whole series of powers proceeds indefinitely

both ways from 1 or the 0 power, positive on the one hand, and negative on the other. Thus,

$$\&c a^{-4} a^{-3} a^{-2} a^{-1} a^0 a^1 a^2 a^3 a^4 \&c,$$

$$\text{or } \&c \frac{1}{a^4} \frac{1}{a^3} \frac{1}{a^2} \frac{1}{a} 1 a a^2 a^3 a^4 \&c.$$

Powers are also denoted with fractional exponents, or even with surd or irrational ones; and then the numerator denotes the power raised to, and the denominator the exponent of some root to be extracted. Thus,

$$\sqrt[2]{a} = a^{\frac{1}{2}}, \text{ and } \sqrt[3]{a^3} = a^1, \text{ and } \sqrt[2]{a^2} = a^1, \&c.$$

And these are sometimes called imperfect powers, or surds.

When the quantity to be raised to any power is positive, all its powers must be positive. And when the radical quantity is negative, yet all its even powers must be positive: because $- \times -$ gives $+$: the odd powers only being negative, or when their exponents are odd numbers. Thus, the powers of $-a$,

$$\text{are } +1, -a, +a^2, -a^3, +a^4, -a^5, +a^6, \&c.$$

where the even powers a^2, a^4, a^6 are positive, and the odd powers a, a^3, a^5 are negative.

Hence, if a power have a negative sign, no even root of it can be assigned; since no quantity multiplied by itself an even number of times, can give a negative product. Thus $\sqrt{-a^2}$, or the square or 2d root of $-a^2$, cannot be assigned; and is called an impossible root, or an imaginary quantity.—Every power has as many roots, real and imaginary, as there are units in the exponent.

M. De la Hire gives a very odd property common to all powers. M. Carre had observed with regard to the number 6, that all the natural cubic numbers, 8, 27, 64, 125, having their roots less than 6, being divided by 6, the remainder of the division is the root itself; and if we go farther, 216, the cube of 6, being divided by 6, leaves no remainder; but the divisor 6 is itself the root. Again, 343, the cube of 7, being divided by 6, leaves 1; which added to the divisor 6, makes the root 7, &c. M. De la Hire, on considering this, has found that all numbers, raised to any power whatever, have divisors, which have the same effect with regard to them, that 6 has with regard to cubic numbers. For finding these divisors, he discovered the following general rule, viz. if the exponent of the power of a number be even, i. e. if the number be raised to the 2d, 4th, 6th, &c. power, it must be divided by 2; the remainder of the division, when there is any, added to 2, or to a multiple of 2, gives the root of this number, corresponding to its power, i. e. the 2d, 6th, &c. root.

But if the exponent of the power be an uneven number, i. e. if the number be raised to the 3d, 5th, 7th, &c. power; the double of this exponent will be the divisor, which has the property above-mentioned. Thus is it found in 6, the double of 3, the exponent of the power of the cubes: so also 10, the double of 5, is the divisor of all 5th powers; &c.

Any power of the natural numbers 1, 2, 3, 4, 5, 6, &c. as the *n*th power, has as many orders of differences as there are units in the common exponent of all the numbers; and the last of those differences is a constant quantity, and equal to the continual product $1 \times 2 \times 3 \times 4 \times \dots \times n$, continued till the last factor, or the number of factors, be *n*, the exponent of the powers.

For more on this curious subject, see the works of Fermat, Ozanam, Hutton's *Mon-tucla*, Gauss, Barlow, &c.

POWER OF AN HYPERBOLA, in conic sections, the square of the fourth part of the conjugate axis.

POWERABLE. *a.* (from *power*.) Capable of performing any thing; not used (*Camden*).

POWERFUL. *a.* (*power* and *full*.) 1. Invested with command or authority; potent. 2. Forcible; mighty (*Milton*). 3. Efficacious; as, a *powerful* medicine.

POWERFULLY. *ad.* Potently; mightily; efficaciously; forcibly (*Tillotson*).

POWERFULNESS. *s.* (from *powerful*.) Power; efficacy; might; force (*Hakewill*).

POWERLESS. *a.* (from *power*.) Weak; impotent (*Shakspeare*).

POX, in medicine. See *LUES VENEREA*.

POX (Small). See *INOCULATION*, &c.

POY. *s.* (*appoy*, Spanish; *appuy*, *poids*, Fr.) A ropedancer's pole.

TO POZE. *v. a.* To puzzle. See *POSE* and *APPOSE* (*Glanville*).

POZZOLANA, **PONZZOLANA**, **PONZ-ZOLANO**. See *PUTEOLANA*.

PRACTICABLE. *a.* (*practicable*, Fr.) 1. Performable; feasible; capable to be practised (*L'Estrange*). 2. Assailable; fit to be assailed; as, a *practicable* breach.

PRACTICABLENESS. *s.* (from *practicable*.) Possibility to be performed.

PRACTICABLY. *ad.* (from *practicable*.) In such a manner as may be performed (*Rogers*).

PRACTICAL. *a.* (*practicus*, Lat.) Relating to action; not merely speculative (*Tillotson*).

PRACTICALLY. *ad.* (from *practical*.) 1. In relation to action. 2. By practice; in real fact (*Houel*).

PRACTICALNESS. *s.* (from *practical*.) The quality of being practical.

PRACTICE. *s.* (*πρaxis*; *pratique*, Fr.)

1. The habit of doing any thing. 2. Use; customary use (*Tate*). 3. Dexterity acquired by habit (*Shakspeare*). 4. Actual performance, distinguished from theory (*South*). 5. Method or art of doing any thing. 6. Medical treatment of diseases (*Shakspeare*). 7. Exercise of any profession (*Blackmore*). 8. (from *πραξ*, Saxon, cunning.) Wicked stratagem; bad artifice: not in use (*Sidney*).

PRACTICE, a rule in arithmetic. See *ARITHMETIC*.

PRACTIC. PRACTICAL. *a.* (*πρaxis*; *practicus*, Latin; *pratique*, French.) 1. Relating to action; not merely theoretical (*Denham*). 2. Sly; artful: not in use (*Spenser*).

TO PRACTISE. *v. a.* (*πρaxis*; *pratiquer*, French.) 1. To do habitually (*Psalms*). 2. To do; not merely to profess: as, to practise *law* or *physic*. 3. To use in order to habit and dexterity.

TO PRACTISE. *v. n.* 1. To form a habit of acting in any manner (*Waller*). 2. To transact; to negotiate secretly (*Addison*). 3. To try artifices (*Granville*). 4. To use bad arts or stratagemis (*Shakspeare*). 5. To use medical methods (*Temple*). 6. To exercise any profession.

PRACTISANT. *s.* (from *practise*.) An agent (*Shakspeare*).

PRACTISER. *s.* (from *practise*.) 1. One that practises any thing; one that does any thing habitually (*South*). 2. One who prescribes medical treatment (*Shakspeare*).

PRACTITIONER. *s.* (from *practise*.) 1. He who is engaged in the actual exercise of any art (*Arbutnot*). 2. One who uses any sly or dangerous arts (*Whitgift*). 3. One who does any thing habitually (*South*).

PRADES, a small handsome town of France, in the department of Eastern Pyrenees, seated on the river Tet, in a fine plain, in the middle of mountains, 22 miles S.E. of Montlouis. Lon. 2. 35 E. Lat. 42. 26 N.

PRAECIPITATE RED. See *HYDRARGYRUS NITRATUS RUBER*.

PRAECIPITATE WHITE. See *CALX HYDRARGYRI ALBA*.

PRAECOGNITA. *s.* (Latin.) Things previously known in order to understand something else (*Locke*).

PRAECORDIA. (from *præ*, before, and *καρδια*, the heart.) The fore part of the region of the thorax.

PRÆMORSE, in botany. Bitten off. Præmorse root; not tapering, but ending blunt, and thus appearing as if it were bitten off short at the end, as in scabiosa, plantago, valeriana. Præmorse leaf: ending very obtusely, with unequal notches.—Præmorse corol: as in althæa.

PRÆMUNIRE, is a punishment inflicted upon him who denies the king's supremacy the second time; upon him who affirms the authority of the Pope, or refuses to take the oath of supremacy; upon such as are seditious talkers of the inheritance of the crown; and upon such as affirm that there is any obligation by any oath, covenant, or engagement whatsoever, to endeavour a change of government either in church or state; or that both or either house of Parliament have or hath a legislative power without the king, &c. The judgment in præmunire at the suit of the king, against the defendant being in prison, is, that he shall be out of the king's protection; that his lands and tenements, goods and chattels, shall be forfeited to the king; and that his body shall remain in prison at the king's pleasure; but if the defendant be condemned upon his default of not appearing, whether at the suit of the king or party, the same judgment shall be given as to the being out of the king's protection and the forfeiture; but instead of

the clause that the body shall remain in prison, there shall be an award of a *capiatu*r or arrest. Upon an indictment of a *præmunire*, a peer of the realm shall not be tried by his peers.

PRÆNESTE, a town of Latium, about 21 miles from Rome, built by Telegonus, son of Ulysses and Circe, or according to others, by Cæcilius, the son of Vulcan. There was a celebrated temple of Fortune there, as also an oracle, which was long in great repute. This is now Palestrina.

PRÆPUCE. (*preputium*.) The membranous cutaneous fold that covers the glans penis and clitoris.

PRÆTOR, one of the chief magistrates at Rome. The office of prætor was first instituted A. U. C. 388, by the senators, and received its name a *præundo*. Only one was originally elected, and another A. U. C. 501. Their number gradually increased to 64, and after this their numbers fluctuated, being sometimes 18, 16, or 12, till in the decline of the empire their dignity decreased, and their numbers were reduced to three. In his public capacity the prætor administered justice, protected the rights of widows and orphans, presided at the celebration of public festivals, and in the absence of the consul assembled or prorogued the senate as he pleased. There were also other duties annexed to his office. When the year of their prætorship was elapsed, they were called *proprætors*, if they still continued at the head of their province.

PRAGMATICAL. **PRAGMATIC**. *a.* (*πραγματικα*.) Meddling; impertinently busy; assuming business without leave or invitation.

PRAGMATIC SANCTION, in the civil law, is defined by Hottoman to be a rescript or answer of the sovereign, delivered by advice of his council, to some college, order, or body of people, upon consulting him on some case of their community. The like answer given to any particular person is called simply rescript. The term pragmatic sanction is chiefly applied to a settlement of Charles VI. emperor of Germany, who, in the year 1722, having no sons, settled his hereditary dominions on his eldest daughter the archduchess Maria Theresa, which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the states-general, and most of the powers in Europe. The word pragmatic is derived from the Greek *πραγμα*, *negotium*, business. It is sometimes also called absolutely *pragmatic*, το *πραγματικον*.

PRAGMATICALLY. *ad.* (from *pragmatical*.) Meddlingly; impertinently.

PRAGMATICALNESS. *s.* (from *pragmatical*.) The quality of intermeddling without right or call.

PRAGUE, a fortified city, capital of Bohemia, and lately an archiepiscopal see. It comprehends four towns, the Old, New, and Little Town, and Radshin. It is 15 miles in circumference, built upon seven hills; has about 100 churches and as many palaces; and contains 80,000 inhabitants. The Muldau runs through the city, separating the Old

Town from the New, and over it is a bridge of 18 arches, with a strong tower at each end. The Old Town is very populous; the houses are high and the streets narrow. In this part is the old palace, where the ancient kings resided; but the finest ornament is the university, frequented by a great number of students. Here also is a magnificent college, formerly belonging to the jesuits, and the Jews have nine synagogues. The New Town contains fine structures, handsome gardens, and large streets; also an arsenal, and a secular foundation, whose abbess was a princess of the empire. The Little Town, which is the most ancient part of Prague, has broad streets, and is very populous. Radshin once belonged to the Little Town, but in 1756 it was made the fourth town of Prague: its principal buildings are the royal palace, in which is a hall, 100 paces long and 40 broad, without any pillar to support the roof; the cathedral of St. Veit, containing the burial-place of the kings and many relics; the chapel of Our Lady of Loretto; the magnificent archiepiscopal palace; and the large palace of Tschernin. Prague has suffered frequent devastations by war, which were however soon repaired. The White mountain, without the gate of Strahow, is celebrated for the victory, in 1620, gained by the Austrians over Frederic V. of the Palatinate, whom the Bohemians had chosen for their king. In 1631, Prague was taken by the Saxons; and by the Swedes in 1648. It was taken by storm by the French in 1741; but they were obliged to leave it in 1742. In 1744, it was taken by the king of Prussia; but he was obliged to abandon it in the same year. It was besieged by the king of Prussia, in 1757, after a great victory, obtained near the city, over the Austrians; but being defeated some time after, he was obliged to raise the siege. It is 75 miles S.E. of Dresden, and 235 N.W. of Vienna. Lon. 14. 42 E. Lat. 50. 6 N.

PRAISE. *s.* (*prijz*, Dutch.) 1. Renown; commendation; fame; honour; celebrity (*Dryden*). 2. Glorification; tribute of gratitude; laud (*Milton*). 3. Ground or reason of praise (*Dryden*).

To PRAISE. *v. a.* (*prijzen*, Dutch.) 1. To commend; to applaud; to celebrate (*Milton*). 2. To glorify in worship (*Psalms*).

PRAISEFUL. *a.* (*praise* and *full*.) Laudable; commendable; not in use (*Chapman*).

PRAISER. *s.* (from *praise*.) One who praises; an applauder; a commander (*Sid*).

PRAISEWORTHY. *a.* (*praise* and *worthy*.) Commendable; deserving praise (*Ben Jonson*).

PRAM, or **PRAME**, a kind of lighter used in Holland and the ports in the Baltic Sea, to carry the cargo of a merchant ship alongside, in order to lade it, or to bring it to the shore to be lodged in warehouses. The same term is in use in military affairs, for a kind of floating battery, being a flat-bottomed vessel, which draws little water, mounts several guns, and is exceedingly useful in transporting troops over the immense lakes in North America.

To PRANCE. *v. n.* (*pronken*, Dutch.) 1. To spring and bound in high mettle (*Wotton*). 2. To ride gallantly and ostentatiously (*Add.*). 3. To move in a warlike or showy manner (*Swift*).

To PRANK. *v. a.* (*pronken*, Dutch.) To decorate; to dress or adjust to ostentation (*Milton*).

PRANK. *s.* A frolic; a wild flight; a ludicrous trick; a mischievous act (*Raleigh*).

PRASE, in mineralogy, a peculiar species of quartz consisting of this substance intimately intermixed with actinolite; found in mass at Brutenbrun in Saxony, of a leek-green colour, with a lustre glistening between resinous and vitreous. See QUARTZUM.

PRASIUM. Hedge-nettle. In botany, a genus of the class didynamia, order gymnospermia. Berries four; one-seeded. Two species; natives of Sicily; shrubby stalks, and leaves like those of baum.

To PRATE. *v. n.* (*praten*, Dutch.) To talk carelessly and without weight; to chatter; to tattle; to be loquacious (*Cleaveland*).

PRATE. *s.* (from the verb.) Tattle; slight talk; unmeaning loquacity (*Denham*).

PRA'TER. *s.* (from *prate*.) An idle talker; a chatterer (*Southern*).

PRATINAS, a Greek poet of Phlius, contemporary with Æschylus. He was the first among the Greeks who composed satires, which were represented as farces (*Paus.*).

PRATINCOLE, in ornithology. See GLAREOLA.

PRA'TINGLY. *ad.* (from *prate*.) With tittle-tattle; with loquacity.

PRA'TIQUE. *s.* (Fr. *prattica*, Italian.) A licence for the master of a ship to traffic in the ports of Italy, upon a certificate that the place from whence he came, is not annoyed with any infectious disease (*Bailey*).

PRATT (Charles), earl Camden, was born in 1713. By dint of perseverance he overcame every obstacle, and rose to the first honours of the profession of the law. In 1759 he was appointed attorney-general; and in 1762 chief justice of the court of common-pleas. In this situation he conducted himself with great dignity, and a sacred regard to the rights and privileges of the British subject; particularly in the affair of Mr. Wilkes in 1763. The corporation of London, on this occasion, presented him with the freedom of the city in a gold box, and caused his picture to be put up in Guildhall, with a suitable inscription. Other cities followed the example of the metropolis, in honouring the integrity of this virtuous judge. In 1765 he was created a peer, and soon after appointed lord chancellor, in which capacity he declared the opinion of the whole court against the validity of general warrants. In 1770 he was removed from his place for opposing the measures of administration with respect to America. In 1782 he was appointed president of the council, which station he resigned next year, but shortly after resumed it, and held it till his death in 1794.

To PRATTLE. *v. n.* (diminutive of *prate*.)

To talk lightly; to chatter; to be trivially loquacious (*Locke*).

PRAT'TLE. *s.* (from the verb.) Empty talk; trifling loquacity (*Shakspeare*).

PRATTLER. *s.* (from *prattle*.) A trifling talker; a chatterer (*Herbert*).

PRA'VITY. *s.* (*pravitas*, Lat.) Corruption; badness; malignity (*South*).

PRAUSNITZ, a town and castle of Silesia, in the lordship of Trachenberg. It has a fine church, containing the tombs of the counts of Hatzfeld, and is seven miles S. of Trachenberg.

PRAXAGORAS, an Athenian writer, who published an history of the kings of his own country. He was then only 19 years old, and three years after that, he wrote the life of Constantine the Great. He had also written the life of Alexander, all now lost.

PRAXIDACE, a goddess among the Greeks, who presided over the execution of enterprizes, and who punished all evil actions.

PRAXITELES, a very famous Greek sculptor, who lived 330 years before Christ, at the time of the reign of Alexander the Great. All the ancient writers mention his statues with a high commendation, especially a Venus executed by him for the city of Cnidos, which was so admirable a piece, that king Nicomedes offered to release the inhabitants from their tribute as the purchase of it; but they refused to part with it. The inhabitants of the isle of Cos requested of Praxiteles a statue of Venus; and in consequence of this application the artist gave them their choice of two; one of which represented the goddess entirely naked, and the other covered with drapery. Both of these were of exquisite workmanship; although the former was esteemed the most beautiful, nevertheless the inhabitants of Cos had the wisdom to give the preference to the latter, from a conviction that no motive whatever could justify their introducing into their city any indecent statues or paintings, which are so likely to inflame the passions of young people, and lead them to immorality and vice. What a reproach will this be to many Christians!—He was one of the gallants of Phryne the celebrated courtesan.

To PRAY. *v. n.* (*prier*, French; *pregare*, Italian.) 1. To make petition to heaven (*Taylor*). 2. To entreat; to act submissively (*Dryden*). 3. I PRAY, is a slightly ceremonious form of introducing a question (*Bentley*).

To PRAY. *v. a.* 1. To supplicate; to implore; to address with submissive petitions (*Milton*). 2. To ask for as a supplicant (*Ayl.*). 3. To entreat in ceremony or form (*Ben Jonson*).

PRA'YER. *s.* (*prire*, French.) 1. Petition to heaven (*Law*). 2. Mode of petition (*White*). 3. Practice of supplication (*Shakspeare*). 4. Single formulæ of petition (*Taylor*). 5. Entreaty; submissive importunity (*Stillington*).

PRAYER, a solemn address to God, which, when it is of any considerable length, consists of adoration, confession, supplication, intercession, and thanksgiving.

P R A Y E R.

By adoration we express our sense of God's infinite perfections, his power, wisdom, goodness, and mercy; and acknowledge that our constant dependence is upon him by whom the universe was created and has been hitherto preserved. By confession is meant our acknowledgment of our manifold transgressions of the divine laws, and our consequent unworthiness of all the good things which we enjoy at present or expect to be conferred upon us hereafter. In supplication we intreat our omnipotent Creator and merciful judge not to deal with us after our iniquities, but to pardon our transgressions, and by his grace to enable us to live henceforth righteously, soberly, and godly, in this present world; and by Christians this intreaty is always made in the name and through the mediation of Jesus Christ, because to them it is known that there is none other name under heaven given unto men whereby they may be saved. To these supplications for mercy we may likewise add our prayers for the necessities of life; because if we seek first the kingdom of God and his righteousness, we are assured that such things shall be added unto us. Intercession signifies those petitions which we offer up for others, for friends, for enemies, for all men, especially for our lawful governors whether supreme or subordinate. And thanksgiving is the expression of our gratitude to God, the giver of every good and perfect gift, for all the benefits enjoyed by us and others, for the means of grace, and for the hope of glory. Such are the component parts of a regular and solemn prayer, adapted either for the church or for the closet. But an ejaculation to God, conceived on any emergency, is likewise a prayer, whether it be uttered by the voice or suffered to remain a mere affection of the mind; because the Being to whom it is addressed discerneth the thoughts of the heart.

That prayer is a duty which all men ought to perform with humility and reverence, has been generally acknowledged as well by the untaught barbarian as by the enlightened Christian.

Nothing so forcibly restrains from ill as the remembrance of a recent address to heaven for protection and assurance. After having petitioned for power to resist temptation, there is so great an incongruity in not continuing the struggle, that we blush at the thought, and persevere lest we lose all reverence for ourselves. After fervently devoting our souls to God, we start with horror at immediate apostacy: every act of deliberate wickedness is then complicated with hypocrisy and ingratitude.

The following objection has been often and seriously alleged against prayer: "If it be most agreeable to perfect wisdom and justice that we should receive what we desire, God, as perfectly wise and just, will give it to us without asking; if it be not agreeable to these attributes of his nature, our entreaties cannot move him to give it us, and it were impious to expect they should." In fewer words, thus: "If what we request be fit for us, we shall have it

without praying; if it be not fit for us, we cannot obtain it by praying." This objection admits but of one answer, namely, that it may be agreeable to perfect wisdom to grant that to our prayers, which it would not have been agreeable to the same wisdom to have given us without praying for. But what virtue, you will ask, is there in prayer, which should make a favour consistent with wisdom, which would not have been so without it? To this question, which contains the whole difficulty attending the subject, the following possibilities are offered in reply.

1. A favour granted to prayer may be more apt, on that very account, to produce good effects upon the person obliged. It may hold in the divine bounty, what experience has raised into a proverb in the collation of human benefits, that which is obtained without asking, is oftentimes received without gratitude.

2. It may be consistent with the wisdom of the Deity to withhold his favours till they be asked for, as an expedient to encourage devotion in his rational creation, in order thereby to keep up and circulate a knowledge and sense of their dependency upon him.

3. Prayer has a natural tendency to amend the petitioner himself, and thus to bring him within the rules which the wisdom of the Deity has prescribed to the dispensation of his favours. If these, or any other assignable suppositions, serve to remove the apparent repugnancy between the success of prayer and the character of the Deity, it is enough; for the question with the petitioner is not from which, out of many motives, God may grant his petition, or in what particular manner he is moved by the supplications of his creatures; but whether it be consistent with his nature to be moved at all, and whether there be any conceivable motives which may dispose the divine will to grant the petitioner what he wants, in consequence of his praying for it. (*Paley's Mor. Philosophy*, vol. 2).

Nearly of like import is the language of William Law. "If men (says he) would consider prayer not only as it is an invocation of God, but also as it is an exercise of holy thoughts, as it is an endeavour to feel and to be affected with the great truths of religion, they would soon see that though God is so good as not to need much calling upon; yet that man is so weak as to need much assistance, and to be under a constant necessity of that help, and light, and improvement, which arises from praying much.

"If God does not give us at our first asking; if he only gives to those who are importunate; it is not because our prayers make any change in God, but because our importunity has made a change in ourselves; it has altered our hearts, and rendered us proper objects of God's gifts and graces. When, therefore, we would know how much we ought to pray, we must consider how much our hearts want to be altered, and remember that the great object of prayer is to work upon ourselves; it is not to move and affect God, but it is to move and affect our

own hearts, and fill them with such tempers as God delights to reward." (*Law on Perfection*, chap. 12).

PRA'YERBOOK. *s.* (*prayer and book*.) Book of public or private devotions (*Shakespeare*).

PRE. (*præ*, Latin.) A particle which marks priority of time or rank.

TO PREACH. *v. n.* (*prædico*, Latin; *precher*, French.) To pronounce a public discourse upon sacred subjects (*Decay of Piety*).

TO PREACH. *v. a.* 1. To proclaim or publish in religious orations (*Acts*). 2. To inculcate publicly; to teach with earnestness (*Dryden*).

PREACH. *s.* (*presche*, French.) A discourse; a religious oration: not in use (*Hooker*).

PREA'CHER. *s.* (*prescheur*, French, from *preach*.) 1. One who discourses publicly upon religious subjects (*Crashaw*). 2. One who inculcates any thing with earnestness and vehemence (*Swift*).

PREACHING. (from the Hebrew *parasch*, *exposuit*, "he expounded.") The art of explaining, and enforcing religious topics orally from the pulpit.

Here it is obvious, the dignity and sanctity of the place, and the importance of the subject, require the preacher to exert the utmost powers of his voice to produce a pronunciation that is perfectly distinct and harmonious, and that he observe a deportment and action which is expressive and graceful. No man, therefore, who is destitute of a voice should ascend the pulpit, and there act the part of a pantomime before his audience. The preacher should not, however, roar like a common crier, and rend the ear with the voice of thunder; for such kind of declamation is not only without meaning and without persuasion, but highly incongruous with the meek and gentle expressions of the gospel. He should likewise take particular care to avoid a monotony; his voice should rise from the beginning, as it were by degrees, and its greatest strength should be exerted in the application. Each inflection of the voice should be adapted to the phrase, and to the meaning of the words; and each remarkable expression should have its peculiar inflexion. The dogmatic requires a plain uniform tone of voice only; and the menaces of the gospel demand a greater force than do its promises and rewards: but the latter should not be pronounced in the soft tone of a flute, nor the former with the loud sound of a trumpet. The voice should still retain its natural tone in all its various inflexions. Happy is that preacher to whom nature has given a voice that is at once strong, flexible, and harmonious.

An air of complacency and benevolence, as well as devotion, should be constantly visible in the countenance of the preacher. But every appearance of affectation must be carefully avoided; for nothing is so disgusting to an audience as even the semblance of dissimulation. Eyes constantly rolling, turned towards heaven, and streaming with tears, rather

denote a hypocrite than a man possessed of the real spirit of religion, and that feels the true import of what he preaches. An air of affected devotion infallibly destroys the efficacy of all that the preacher can say, however just and important it may be. On the other hand, he must avoid every appearance of mirth or raillery, or of that cold and unfeeling manner which is so apt to freeze the hearts of his hearers.

The body should be in general erect, and in a natural and easy attitude. The perpetual movement, or contortion of the body, has a ridiculous effect in the pulpit, and makes the figure of a preacher and a harlequin much too similar. But, on the other hand, he should not remain constantly upright and motionless, like a speaking statue.

The motions of the hands give a strong expression to a discourse; but they should be constantly decent, grave, noble, and expressive. The preacher who is incessantly in action, who is perpetually clapping his hands, or who menaces with a clenched fist, or counts his arguments on his fingers, will only excite mirth among his auditory. In a word, declamation is an art that the sacred orator should study with the utmost assiduity. The design of a sermon is to convince, to affect, and to persuade. The voice, the countenance, and the action, which are to produce this triple effect, are therefore the objects to which the preacher should particularly apply himself.

Nothing is more incompatible with the business of a preacher than a dead and frigid manner. "A statue hung round with moral sentences," says Dr. Watts, "or a marble pillar with divine truths inscribed upon it, may preach coldly to the understanding, while devotion freezes at the heart. But the prophets and apostles were *burning and shining lights*; they were all taught by inspiration to make the words of truth glitter like sun-beams, and to operate like a hammer, and a fire, and a two-edged sword. The movements of sacred passion may be the ridicule of an age which pretends to nothing but calm reasoning. Life and zeal in the ministry of the word may be despised by men of lukewarm and dying religion. Fervency of spirit in the service of the Lord may become the scoff and jest of the critic and the profane: but this very life and zeal, this sacred fervency, shall still remain one bright character of a christian preacher, till the names of Paul and Apollos perish from the church; and that is, till this Bible and these heavens are no more."

It will be observed that we have said nothing here respecting the *reading* of sermons. Our reason is obvious: reading is not preaching, but bears about the same relation to it that leaning upon crutches does to walking. The practice, prevalent as it is, has been forbidden by the highest authority; in proof of which we here insert the following curious document. It is an extract from the statute book of the university of Cambridge, page 300, Carol. II. Rex.

" Vice-chancellor and gentlemen,

" Whereas his majesty is informed that the practice of reading sermons is generally taken up by the preachers before the university, and therefore continues even before himself; his majesty hath commanded me to signify to you his pleasure, that the said practice, which took its beginning from the disorders of the late times; be wholly laid aside; and that the said preachers deliver their sermons, both in Latin and English, by memory, without book; as being a way of preaching which his majesty judgeth most agreeable to the use of foreign churches, to the custom of the university heretofore, and to the nature of that holy exercise. And, that his majesty's commands in these premises may be duly regarded and observed, his further pleasure is, that the names of all such ecclesiastical persons as shall continue the present supine and slothful way of preaching be, from time to time, signified to me, by the vice-chancellor for the time being, on pain of his majesty's displeasure.

" MONMOUTH."

" Oct. 8th, 1674."

PREA'CHMENT. *s.* (from *preach*.) A sermon mentioned in contempt; a discourse affectedly solemn (*L'Estrange*).

PREAMBLE. *s.* (*preambule*, French.) Something previous; introduction; preface (*Hooker*).

PREAMBULARY. **PREA'MBULOUS.** *a.* (from *preamble*.) Previous (*Brown*).

PREAPPREHENSION. *s.* (*pre* and *apprehend*.) An opinion formed before examination (*Brown*).

PREASE. *s.* Press; crowd: obsolete (*Spenser*).

PRES'ING. *part. a.* Crowding (*Spenser*).

PREBEND, the maintenance a prebendary receives out of the estate of a cathedral or collegiate church. Prebends are distinguished into simple and dignitary: a simple prebend has no more than the revenue for its support: but a prebend with dignity; has always a jurisdiction annexed to it.

PREBENDARY, an ecclesiastic who enjoys a prebend. The difference between a prebendary and a canon is, that the former receives his prebend in consideration of his officiating in the church; but the latter merely by his being received into the cathedral or college.

PREBENDARY (Golden), of Hereford, called also *prebendarius episcopus*, is one of the twenty-eight minor prebendaries, who has, *ex officio*, the first canon's place that falls. He was anciently confessor of the bishop and cathedral, and had the offerings at the altar; on which account he was called the golden prebendary.

PRECA'RIOUS. *a.* (*precarius*, Latin.) Dependent; uncertain, because depending on the will of another; held by courtesy (*Addison*).

PRECA'RIOUSLY. *ad.* Uncertainly by dependence; dependently.

PRECA'RIOUSNESS. *s.* (from *precarius*.) Uncertainty; dependence on others (*Sharp*).

PRECAUTION. *s.* (*precaution*, Fr.) Preservative caution; preventive measures (*Addison*).

To PRECAUTION. *v. a.* (*precautioner*, Fr.) To warn beforehand (*Locke*).

PRECEDA'NEOUS. *a.* Previous; antecedent.

To PRECE'DE. *v. a.* (*præcedo*, Latin.) 1. To go before in order of time (*Dryden*). 2. To go before according to the adjustment of rank.

PRECE'DENCE. **PRECE'DENCY.** *s.* (from *præcedo*, Latin.) 1. The act or state of going before; priority. 2. Something going before; something past: not used (*Shakspeare*). 3. Adjustment of place (*Hale*). 4. The foremost in ceremony (*Dryden*). 5. Superiority (*Loc.*).

PRECEDENCE, or **PRECEDENCY**, a place of honour to which a person is entitled: this is either of courtesy or of right. The former is that which is due to age, estate, &c. which is regulated by custom and civility: the latter is settled by authority, and when broken in upon gives an action at law. The order of precedence, for all ranks, as established at the Herald's college, is shown in our article **HERALDRY**.

PRECEDENT. *a.* (*precedent*, French; *præcedens*, Latin.) Former; going before (*South*).

PRE'CEDENT. *s.* Any thing that is a rule or example to future times; any thing done before of the same kind (*Granville*).

PRECEDENTLY. *ad.* (from *precedent*, adj.) Beforehand.

PRECENTOR. *s.* (*præcentor*, Lat. *præcenteur*, French.) He that leads the choir (*Hammond*).

PRE'CEPT. *s.* (*præceptum*, Latin.) A rule authoritatively given; a mandate (*Dryden*).

PRECEPTIAL. *a.* (from *precept*.) Consisting of precepts: not in use (*Shakspeare*).

PRECEPTIVE. *a.* (*præceptivas*, Latin.) Containing precepts; giving precepts (*L'Estrange*).

PRECEPTOR. *s.* (*præceptor*, Latin.) A teacher; a tutor (*Blackmore*).

PRECESSION. *s.* (*præcessus*, Latin.) The act of going before.

PRECESSION OF THE EQUINOXES. The most obvious of all the celestial motions is the diurnal revolution of the stary heavens. The whole appears to turn round an imaginary axis, which passes through two opposite points of the heavens, called the poles. One of these is in our sight, being very near the star in the tail of the little bear. The great circle which is equidistant from both poles divides the heavens into the northern and southern hemispheres, which are equal. It is called the equator, and it cuts the horizon in the east and west points, and every star in it is 12 sideral hours above and as many below the horizon, in each revolution.

The sun's motions determine the length of day

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and night, and the vicissitudes of the seasons. By a long series of observations, the shepherds of Asia were able to mark out the sun's path in the heavens; he being always in the opposite point to that which comes to the meridian at midnight, with equal but opposite declination. Thus they could tell the stars among which the sun then was, although they could not see them. They discovered that his path was a great circle of the heavens, afterward called the ecliptic; which cuts the equator in two opposite points, dividing it, and being divided by it, into two equal parts. They further observed, that when the sun was in either of these points of intersection, his circle of diurnal revolution coincided with the equator, and therefore the days and nights were equal. Hence the equator came to be called the equinoctial line, and the points in which it cuts the ecliptic were called the equinoctial points, and the sun was then said to be in the equinoxes. One of these was called the vernal and the other the autumnal equinox.

It was evidently an important problem in practical astronomy, to determine the exact moment of the sun's occupying these stations; for it was natural to compute the course of the year from that moment. Accordingly, this has been the leading problem in the astronomy of all nations. It is susceptible of considerable precision, without any apparatus of instruments. It is only necessary to observe the sun's declination on the noon of two or three days before and after the equinoctial day. On two consecutive days of this number, his declination must have changed from north to south, or from south to north. If his declination on one day was observed to be $21'$ north, and on the next $5'$ south, it follows that his declination was nothing, or that he was in the equinoctial point about 23 minutes after 7 in the morning of the second day. Knowing the precise moments, and knowing the rate of the sun's motion in the ecliptic, it is easy to ascertain the precise point of the ecliptic in which the equator intersected it.

By a series of such observations made at Alexandria, between the years 161 and 127 before Christ, Hipparchus, the father of our astronomy, found that the point of the autumnal equinox was about six degrees to the eastward of the star called spica virginis. Eager to determine every thing by multiplied observations, he ransacked all the Chaldaean, Egyptian, and other records, to which his travels could procure him access, for observations of the same kind; but he does not mention his having found any. He found, however, some observations of Aristillus and Timochares made about 150 years before. From these it appeared evident that the point of the autumnal equinox was then about eight degrees east of the same star. He discusses these observations with great sagacity and rigour; and, on their authority, he asserts that the equinoctial points are not fixed in the heavens, but move to the westward about a degree in 75 years, or somewhat less.

This motion is called the precession of the equinoxes, because by it the time and place of the sun's equinoctial station precedes the usual calculations; it is fully confirmed by all subsequent observations. In 1750 the autumnal equinox was observed to be $20^{\circ} 21'$ westward of spica virginis. Supposing the motion to have been uniform during this period of ages, it follows that the annual precession is about $50\frac{1}{2}''$; that is, if the celestial

equator cut the ecliptic in a particular point on any day of this year it will on the same day of the following year cut it in a point $50\frac{1}{2}''$ to the west of it, and the sun will come to the equinox $20' 23''$ before he has completed his round of the heavens. Thus the equinoctial or tropical year, or true year of seasons, is so much shorter than the revolution of the sun or the sidereal year.

It is this discovery that has chiefly immortalized the name of Hipparchus, though it must be acknowledged that all his astronomical researches have been conducted with the same sagacity and intelligence. It was natural therefore for him to value himself highly for the discovery. It must be acknowledged to be one of the most singular that has been made, that the revolution of the whole heavens should not be stable, but its axis continually changing. For it must be observed, that since the equator changes its position, and the equator is only an imaginary circle, equidistant from the two poles or extremities of the axis; these poles and this axis must equally change their positions. The equinoctial points make a complete revolution in about 25745 years, the equator being all the while inclined to the ecliptic in nearly the same angle. Therefore the poles of this diurnal revolution must describe a circle round the poles of the ecliptic at the distance of about $23\frac{1}{2}$ degrees in 25745 years; and in the time of Timochares the north pole of the heavens must have been 30 degrees eastward of where it now is.

Hipparchus has been accused of plagiarism and insincerity in this matter. It is now very certain that the precession of the equinoxes was known to the astronomers of India many ages before the time of Hipparchus. It appears also that the Chaldeans had a pretty accurate knowledge of the year of seasons. From their saros we deduce their measure of this year to be 365 days 5 hours 49 minutes and 11 seconds, exceeding the truth only by $26''$, and much more exact than the year of Hipparchus. They had also a sidereal year of 365 days 6 hours 11 minutes. Now what could occasion an attention to two years, if they did not suppose the equinoxes moveable? the Egyptians also had a knowledge of something equivalent to this; for they had discovered that the dog-star was no longer the faithful forewarner of the overflowing of the Nile, and they combined him with the star Fomalhaut in their mystical kalendar. This knowledge is also involved in the precepts of the Chinese astronomy, of much older date than the time of Hipparchus.

But all these acknowledged facts are not sufficient for depriving Hipparchus of the honour of the discovery, or fixing on him the charge of plagiarism. This motion was a thing unknown to the astronomers of the Alexandrian school, and it was pointed out to them by Hipparchus in the way in which he ascertained every other position in astronomy, namely, as the mathematical result of actual observations, and not as a thing deducible from any opinions on other subjects related to it. We see him, on all other occasions, eager to confirm his own observations, and his deductions from them, by every thing he could pick up from other astronomers; and he even adduced the above-mentioned practice of the Egyptians in corroboration of his doctrine. It is more than probable then that he did not know any thing more. Had he known the Indian precession of $54''$ annually, he had no temptation whatever to withhold him from using it in preference to one which he ac-

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knowledge to be inaccurate, because deduced from the short period of 150 years, and from the observations of Timochares, in which he had no great confidence.

This motion of the starry heavens was long a matter of discussion, as a thing for which no physical reason could be assigned. But the establishment of the Copernican system reduced it to a very simple affair; the motion which was thought to affect all the heavenly bodies, is now acknowledged to be a deception, or a false judgment from the appearances. The earth turns round its own axis while it revolves round the sun, in the same manner as we may cause a child's top to spin on the brim of a mill-stone, while the stone is turning slowly round its axis. If the top spin steadily, without any wavering, its axis will always point to the zenith of the heavens; but we frequently see, that while it spins briskly round its axis, the axis itself has a slow conical motion round the vertical line, so that, if produced, it would slowly describe a circle in the heavens round the zenith point. The flat surface of the top may represent the terrestrial equator, gradually turning itself round on all sides. If this top were formed like a ball, with an equatorial circle on it, it would represent the whole motion very prettily, the only difference being, that the spinning motion and this wavering motion are in the same direction; whereas the diurnal rotation and the motion of the equinoctial points are in contrary directions. Even this dissimilarity may be removed, by making the top turn on a cap, like the card of a mariner's compass.

It is now a matter fully established, that while the earth revolves round the sun from west to east, in the plane of the ecliptic, in the course of a year it turns round its own axis from west to east in $23^h 56' 4''$, which axis is inclined to this plane in an angle of nearly $23^\circ 28'$: and that this axis turns round a line perpendicular to the ecliptic in 25,745 years from east to west, keeping nearly the same inclination to the ecliptic.—By this means, its pole in the sphere of the starry heavens describes a circle round the pole of the ecliptic at the distance of $23^\circ 28'$ nearly. The consequence of this must be, that the terrestrial equator, when produced to the sphere of the starry heavens, will cut the ecliptic in two opposite points, through which the sun must pass when he makes the day and night equal; and that these points must shift to the westward, at the rate of $50\frac{1}{2}$ seconds annually, which is the precession of the equinoxes. Accordingly this has been the received doctrine among astronomers for nearly three centuries, and it was thought perfectly conformable to appearances.

But Dr. Bradley, the most sagacious of modern astronomers, hoped to discover the parallax of the earth's orbit by observations of the actual position of the pole of the celestial revolution. Dr. Hooke had attempted this before, but with very imperfect instruments. The art of observing being now prodigiously improved, Dr. Bradley resumed this investigation. It will easily appear, that if the earth's axis keep parallel to itself, its extremity must describe in the sphere of the starry heavens a figure equal and parallel to its orbit round the sun; and if the stars be so near that this figure is a visible object, the pole of diurnal revolution will be in different distinguishable points of this figure. Consequently, if the axis describe the cone already mentioned, the pole will not describe a circle round the pole of the

ecliptic, but will have a looped motion along this circumference, similar to the absolute motion of one of Jupiter's satellites, describing an epicycle whose centre describes the circle round the pole of the ecliptic.

He accordingly observed such an epicyclical motion, and thought that he had now overcome the only difficulty in the Copernican system; but, on maturely considering his observations, he found this epicycle to be quite inconsistent with the consequences of the annual parallax, and it puzzled him exceedingly. One day, while taking the amusement of sailing about on the Thames, he observed that every time the boat tacked, the direction of the wind, estimated by the direction of the vane, seemed to change. This immediately suggested to him the cause of his observed epicycle, and he found it an optical illusion, occasioned by a combination of the motion of light with the motion of his telescope while observing the polar stars. Thus he unwittingly established an incontrovertible argument for the truth of the Copernican system, and immortalized his name by his discovery of the aberration of the stars.

He now engaged in a series of observations for ascertaining all the circumstances of this discovery. In the course of these, which were continued for 28 years, he discovered another epicyclical motion of the pole of the heavens, which was equally curious and unexpected. He found that the pole described an epicycle, whose diameter was about $18'$, having for its centre that point of the circle round the pole of the ecliptic in which the pole would have been found independent of this new motion. He also observed, that the period of this epicyclical motion was 18 years and seven months. It struck him, that this was precisely the period of the revolution of the nodes of the moon's orbit. He gave a brief account of these results to lord Macclesfield, then president of the Royal Society, in 1747. Mr. Machin, to whom he also communicated the observations, gave him in return a very neat mathematical hypothesis, by which the motion might be calculated.

Let E (pl. 142, fig. 1), be the pole of the ecliptic, and SPQ a circle distant from it $23^\circ 28'$, representing the circle described by the pole of the equator during one revolution of the equinoctial points. Let P be the place of this last mentioned pole at some given time, Round P describe a circle ABCD, whose diameter AC is $18'$. The real situation of the pole will be in the circumference of this circle; and its place, in this circumference, depends on the place of the moon's ascending node. Draw EPF and GPL perpendicular to it; let GL be the colure of the equinoxes, and EF the colure of the solstices. Dr. Bradley's observations showed that the pole was in A when the node was in L, the vernal equinox. If the node recede to H, the winter solstice, the pole is in B. When the node is in the autumnal equinox at G the pole is at C; and when the node is in F, the summer solstice, the pole is in D. In all intermediate situations of the moon's ascending node, the pole is in a point of the circumference ABCD, three signs or 90° more advanced.

Dr. Bradley, by comparing together a great number of observations, found that the mathematical theory, and the calculation depending on it, would correspond much better with the observations, if an eclipse were substituted for the circle ABCD, making the longer axis AC $18'$, and the shorter, BD, $16'$. Mr. D'Alembert determined,

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by the physical theory of gravitation, the axis to be $18''$ and $13''.4$.

These observations, and this mathematical theory must be considered as so many facts in astronomy, and we must deduce from them the methods of computing the places of all celestial phenomena, agreeable to the universal practice of determining every point of the heavens by its longitude, latitude, right ascension, and declination.

It is evident, in the first place, that this equation of the pole's motion makes a change in the obliquity of the ecliptic. The inclination of the equator to the ecliptic is measured by the arch of a great circle intercepted between their poles. Now, if the pole be in O instead of P , it is plain that the obliquity is measured by EO instead of EP . If EP be considered as the mean obliquity of the ecliptic, it is augmented by $9''$ when the moon's ascending node is in the vernal equinox, and consequently the pole in A . It is, on the contrary, diminished $9''$ when the node is in the autumnal equinox, and the pole in C ; and it is equal to the mean when the node is in the colure of the solstices. This change of the inclination of the earth's axis to the plane of the ecliptic was called the nutation of the axis by sir Isaac Newton; who showed that a change of nearly a second must obtain in a year by the action of the sun on the prominent parts of the terrestrial spheroid. But he did not attend to the change which would be made in this motion by the variation which obtains in the disturbing force of the moon, in consequence of the different obliquity of her action on the equator, arising from the motion of her own oblique orbit. It is this change which now goes by the name nutation, and we owe its discovery entirely to Dr. Bradley. The general change of the position of the earth's axis has been termed deviation by modern astronomers.

The quantity of this change of obliquity is easily ascertained. It is evident from what has been already said, that when the pole is in O , the arch $ADCO$ is equal to the node's longitude from the vernal equinox, and that PM is its confine; and (on account of the smallness of AP in comparison of EP) PM may be taken for the change of the obliquity of the ecliptic. This is therefore $= 9'' + \cos. \text{long. node}$, and is additive to the mean obliquity, while O is in the semicircle BAD , that is, while the longitude of the node is from 9 signs to 3 signs; but subtractive while the longitude of the node changes from 3 to 9 signs.

But the nutation changes also the longitudes and right ascensions of the stars and planets, by changing the equinoctial points, and thus occasioning an equation in the precession of the equinoctial points. It was this circumstance which made it necessary for us to consider it in this place, while expressly treating of this precession. Let us attend to this derangement of the equinoctial points.

The great circle or meridian which passes through the poles of the ecliptic and equator is always the solstitial colure, and the equinoctial colure is at right angles to it: therefore when the pole is in P or in O , EP or EO is the solstitial colure. Let S be any fixed star or planet, and let SE be a meridian or circle of longitude; draw the circles of declination PS , OS , and the circles $M'EM'$, mEm' , perpendicular to PE , OE .

If the pole were in its mean place P , the equinoctial points would be in the ecliptic meridian $M'EM'$, or that meridian would pass through the intersections of the equator and ecliptic, and the

angle $M'ES$ would measure the longitude of the star S . But when the pole is in O , the ecliptic meridian mEm' will pass through the equinoctial points. The equinoctial points must therefore be to the westward of their mean place, and the equation of the precession must be additive to that precession: and the longitude of the star S will now be measured by the angle mES , which, in the case here represented, is greater than its mean longitude. The difference, or the equation of longitude arising from the nutation of the earth's

axis, is the angle OEP , or $\frac{OM}{OE}$. OM is the sine of

the angle CPO , which, by what has been already observed, is equal to the longitude of the node: Therefore OM is equal to $9'' + \text{long. node}$, and $\frac{OM}{OE}$ is equal to $\frac{9'' + \text{long. node}}{\sin. \text{obl. eclip.}}$. This

equation is additive to the mean longitude of the star when O is in the semicircle CBA , or while the ascending node is passing backwards from the vernal to the autumnal equinox; but it is subtractive from it while O is in the semicircle ADC , or while the node is passing backwards from the autumnal to the vernal equinox; or, to express it more briefly, the equation is subtractive, from the mean longitude of the star, while the ascending node is in the first six signs, and additive to it while the node is in the last six signs.

This equation of longitude is the same for all the stars, for their longitude is reckoned on the ecliptic (which is here supposed invariable); and therefore is affected only by the variation of the point from which the longitude is computed.

The right ascension, being computed on the equator, suffers a double change. It is computed from, or begins at, a different point of the equator, and it terminates at a different point; because the equator having changed its position, the circles of declination also change theirs. When the pole is at P , the right ascension of S from the solstitial colure is measured by the angle SPE , contained between that colure and the star's circle of declination. But when the pole is at O , the right ascension is measured by the angle SOE , and the difference of SPE and SOE is the equation of right ascension. The angle SOE consists of two parts, GOE and GOS ; GOE remains the same wherever the star S is placed, but GOS varies with the place of the star.—We must first find the variation by which GPE becomes GOE , which variation is common to all the stars. The triangles GPE , GOE have a constant side GE , and a constant angle G ; the variation PO of the side GP is extremely small, and therefore the variation of the angles may be computed by Mr. Cotes's Fluxionary Theorems. See Simpson's Fluxions, § 253, &c. As the tangent of the side EP opposite to the constant angle G , is to the sine of the angle EPG , opposite to the constant side EG , so is PO the variation of the side GP adjacent to the constant angle, to the variation x of the angle GPO , opposite to the constant side EG . This gives $x = \frac{9'' \times \sin. \text{long. node}}{\text{tang. obl. eclip.}}$.

This is subtractive from the mean right ascension for the first six signs of the node's longitude, and additive for the last six signs. This equation is common to all the stars.

The variation or the other part SOG of the angle, which depends on the different position of the hour circles PS and OS , which causes them to cut the equation in different points, where the arches of right ascension terminate may be discovered as

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follows. The triangles SPG, SOG, have a constant side SG, and a constant angle G. Therefore, by the same Cotesian theorem, $\tan. SP: \sin. SPG = FO: y$, and y , or the second part of the nutation in right ascension, =

$$9^\circ \times \sin. \text{diff. R. A. of star and node.} \\ \cotan. \text{declin. star.}$$

The nutation also effects the declination of the stars. For SP, the mean codeclination, is changed into SO.—Suppose a circle described round S with the distance SO cutting SP in f ; then it is evident that the equation of declin. is $Pf = PO \times \cosine OPf = 9^\circ \times \sin. r. \text{ ascen. of star—long. of node.}$

Such are the calculations in constant use in our astronomical researches, founded on Machin's Theory. When still greater accuracy is required, the elliptical theory must be substituted, by taking (as is expressed by the dotted lines) O in that point of the ellipse described on the transverse axis AC, where it is cut by OM, drawn according to Machin's theory. All the change made here is the diminution of OM in the ratio of 18 to 13.4, and a corresponding diminution of the angle CPO. The detail of it may be seen in De la Lande's Astronomy, art. 2874; but is rather foreign to our present purpose of explaining the precession of the equinoxes. The calculations being in every case tedious, and liable to mistakes, on account of the changes of the signs of the different equations, the zealous promoters of astronomy have calculated and published tables of all these equations, both on the circular and elliptical hypothesis. And still more to abridge calculations, which occur in reducing every astronomical observation, when the place of a phenomenon is reduced from a comparison with known fixed stars, there have been published tables of nutation and precession, for some hundreds of the principal stars, for every position of the moon's node and of the sun.

It now remains to consider the precession of the equinoctial points, with its equations, arising from the nutation of the earth's axis as a physical phenomenon, and to endeavour to account for it upon those mechanical principles, which have so happily explained all the other phenomena of the celestial motions.

: This did not escape the penetrating eye of sir Isaac Newton; and he quickly found it to be a consequence, and the most beautiful proof, of the universal gravitation of all matter to all matter; and there is no part of his immortal work where his sagacity and fertility of resource shine more conspicuously than in this investigation. It must be acknowledged, however, that Newton's investigation is only a shrewd guess founded on assumptions of which it would be extremely difficult to demonstrate either the truth or falsity, and which required the genius of a Newton to pick out in such a complication of abstruse circumstances. The subject has occupied the attention of the first mathematicians of Europe since his time; and is still considered as the most curious and difficult of all mechanical problems. The most elaborate and accurate dissertations on the precession of the equinoxes are those of Sylvestra and Walmesley, in the Philosophical Transactions, published about the year 1754; that of Thomas Simpson, published in his Miscellaneous Tracts; that of Father Frisius, in the Memoirs of the Berlin Academy, and afterwards, with great improvements in his Cosmographia; that of Euler in the Memoirs of Berlin; that of D'Alembert in a separate disser-

tation; and that of De la Grange on the Libration of the Moon, which obtained the prize in the Academy of Paris, in 1769. We think the dissertation of Father Frisius the most perspicuous of them all, being conducted in the method of geometrical analysis; whereas most of the others proceed in the fluxionary and symbolic method, which is frequently deficient in distinct notions of the quantities under consideration, and therefore does not give us the same perspicuous conviction of the truth of the results. In a work like ours, it is impossible to do justice to the problem, without entering into a detail which would be thought extremely disproportioned to the subject by the generality of our readers. Yet those who have the necessary preparation of mathematical knowledge, and wish to understand the subject fully, will find enough here to give them a very distinct notion of it; and in the article ROTATION they will find the fundamental theorems, which will enable them to carry on the investigation. We shall first give a short sketch of Newton's investigation, which is of the most palpable and popular kind, and is highly valuable, not only for its ingenuity, but also because it will give our unlearned readers distinct and satisfactory conceptions of the chief circumstances of the whole phenomena.

Let S (fig. 2.) be the sun, E the earth, and M the moon, moving in the orbit NMCDn, which cuts the plane of the ecliptic in the line of the nodes Nn, and has one half raised above it, as represented in the figure, the other half being hid below the ecliptic. Suppose this orbit folded down; it will coincide with the ecliptic in the circle N m c d n. Let EX represent the axis of this orbit perpendicular to its plane, and therefore inclined to the ecliptic. Since the moon gravitates to the sun in the direction MS, which is all above the ecliptic, it is plain that this gravitation has a tendency to draw the moon towards the ecliptic. Suppose this force to be such that it would draw the moon down from M to i in the time that she would have moved from M to t , in the tangent to her orbit. By the combination of these motions, the moon will desert her orbit, and describe the line Mr, which makes the diagonal of the parallelogram; and if no further action of the sun be supposed, she will describe another orbit Mm', lying between the orbit MCDn and the ecliptic, and she will come to the ecliptic, and pass through it in a point n' , nearer to M than n is, which was the former place of her descending node. By this change of orbit, the line EX will no longer be perpendicular to it; but there will be another line Ex, which will now be perpendicular to the new orbit. Also the moon, moving from M to r , does not move as if she had come from the ascending node N, but from a point N' lying beyond it; and the line of the nodes of the orbit in this new position is N' n'. Also the angle MN'm is less than the angle MNm.

Thus the nodes shift their places in a direction opposite to that of her motion, or move to the westward; the axis of the orbit changes its position, and the orbit itself changes its inclination to the ecliptic. These momentary changes are different in different parts of the orbit, according to the position of the line of the nodes. Sometimes the inclination of the orbit is increased, and sometimes the nodes move to the eastward. But, in general, the inclination increases from the time that the nodes are in the line of syzygee, till they get into quadrature, after which it diminishes till the nodes

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are again in syzygie. The nodes advance only while they are in the octants after the quadratures, and while the moon passes from quadrature to the node, and they recede in all other situations. Therefore the recess exceeds the advance in every revolution of the moon round the earth, and, on the whole, they recede.

What has been said of one moon would be true of each of a continued ring of moons surrounding the earth, and they would thus compose a flexible ring, which would never be flat, but waved according to the difference (both in kind and degree) of the disturbing forces acting on its different parts. But suppose these moons to cohere, and to form a rigid and flat ring, nothing would remain in this ring but the excess of the contrary tendencies of its different parts. Its axis would be perpendicular to its plane, and its position in any moment will be the mean position of all the axis of the orbits of each part of the flexible ring; therefore the nodes of this rigid ring will continually recede, except when the plane of the ring passes through the sun, that is, when the nodes are in syzygie; and (says Newton) the motion of these nodes will be the same with the mean motion of the nodes of the orbit of one moon. The inclination of this ring to the ecliptic will be equal to the mean inclination of the moon's orbit during any one revolution which has the same situation of the nodes. It will therefore be least of all when the nodes are in quadrature, and will increase till they are in syzygie, and then diminish till they are again in quadrature.

Suppose this ring to contract in dimensions, the disturbing forces will diminish in the same proportion, and in this proportion will all their effects diminish. Suppose its motion of revolution to accelerate, or the time of a revolution to diminish; the linear effects of the disturbing forces being as the squares of the times of their action, and their angular effects as the times, those errors must diminish also on this account; and we can compute what those errors will be for any diameter of the ring, and for any period of its revolution. We can tell, therefore, what would be the motion of the nodes, the change of inclination, and deviation of the axis, of a ring which would touch the surface of the earth, and revolve in 24 hours; nay, we can tell what these motions would be, should this ring adhere to the earth. They must be much less than if the ring were detached; for the disturbing forces of the ring must drag along with it the whole globe of the earth. The quantity of motion which the disturbing forces would have produced in the ring alone will now (says Newton) be produced in the whole mass; and therefore the velocity must be as much less as the quantity of matter is greater: But still all this can be computed.

Now there is such a ring on the earth: for the earth is not a sphere, but an elliptical spheroid. Sir Isaac Newton therefore engaged in a computation of the effects of the disturbing force, and has exhibited a most beautiful example of mathematical investigation. He first asserts, that the earth must be an elliptical spheroid, whose polar axis is to its equatorial diameter, as 229 to 230. Then he demonstrates, that if the sine of the inclination of the equator be called π , and if t be the number of days (sidereal) in a year, the annual motion of

then shows that the effect of the disturbing force on this ring is to its effect on the matter of the same ring, distributed in the form of an elliptical stratum (but still detached) as 5 to 2; therefore,

the motion of the nodes will be $360^\circ \times \frac{3\sqrt{1-\pi^2}}{10t}$

or $16' 16'' 24'''$ annually. He then proceeds to show, that the quantity of motion in the sphere is to that in an equatorial ring revolving in the same time, as the matter in the sphere to the matter in the ring, and as three times the square of a quadrantal arch to two squares of a diameter, jointly: Then he shows, that the quantity of matter in the terrestrial sphere is to that in the protuberant matter of the spheroid, as 52900 to 461 (supposing all homogeneous). From these premises it follows, that the motion of $16' 16'' 24'''$, must be diminished in the ratio of 10717 to 100, which reduces it to $9' 07'''$ annually. And this (he says) is the precession of the equinoxes, occasioned by the action of the sun; and the rest of the $50\frac{3}{4}''$, which is the observed precession, is owing to the action of the moon, nearly five times greater than that of the sun. This appeared a great difficulty: for the phenomena of the tides show that it cannot much exceed twice the sun's force.

Nothing can exceed the ingenuity of this process. Justly does his celebrated and candid commentator, Daniel Bernoulli, say (in his Dissertation on the Tides, which shared the prize of the French Academy with M'Laurin and Euler), that Newton saw through a veil what others could hardly discover with a microscope in the light of the meridian sun. His termination of the form and dimensions of the earth, which is the foundation of the whole process, is not offered as any thing better than a probable guess, in *re difficilima*; and it has been since demonstrated with geometrical rigour by M'Laurin.

His next principle, that the motion of the nodes of the rigid ring is equal to the mean motion of the nodes of the moon, has been most critically discussed by the first mathematicians, as a thing which could neither be proved nor refuted. Frisius has at least shown it to be a mistake, and that the motion of the nodes of the ring is double the mean motion of the nodes of a single moon; and that Newton's own principles should have produced a precession of $18\frac{1}{2}$ seconds annually, which removes the difficulty formerly mentioned.

His third assumption, that the quantity of motion of the ring must be shared with the included sphere, was acquiesced in by all his commentators, till D'Alembert and Euler, in 1749, shewed that it was not the quantity of motion round an axis of rotation which remained the same, but the quantity of momentum or rotatory effort. The quantity of motion is the product of every particle, by its velocity; that is, by its distance from the axis; while its momentum, or power of producing rotation, is as the square of that distance, and is to be had by taking the sum of each particle multiplied by the square of its distance from the axis. Since the earth differs so little from a perfect sphere, this makes no sensible difference in the result. It will increase Newton's precession about three fourths of a second.

The real source of Newton's mistake in the solution of this intricate and interesting problem was first detected by Mr. Landen, in the first volume of his Memoirs. That excellent mathematician discovered that when a rigid annulus revolves

a detached ring will be $360^\circ \times \frac{3\sqrt{1-\pi^2}}{4t}$. He

with two motions, one in its own plane, and the other round one of its diameters, half the motive force acting upon the ring is counteracted by the centrifugal force arising from the compound motion, and half only is efficacious or accelerating the plane of the annulus round its diameter. Mr. Landen did not expressly demonstrate this; but it has been done very elegantly by Dr. Brinkley, in the 7th volume of the Memoirs of the Irish Academy.

We cannot enter further upon this subject here; but beg to refer the mathematical reader to Dr. Milner's paper in the Philosophical Transactions, to Dr. Abram Robertson's paper in the Philosophical Transactions for 1807, to the Dissertation of Frisius already specified, and to the popular view of this problem by M. Laplace in his Exposition, book iv. ch. 13.

To find the precession in right ascension and declination.

Put d = the declination of a star,
and a = its right ascension;
then their annual variations of precessions will be nearly as follow:

viz. $20'' \cdot 084 \times \cos. a$ = the annual precession in declinat.

and $46'' \cdot 0619 + 20'' \cdot 084 \times \sin. a \times \text{tang. } d$
= that of right ascension. See the Connoissance des Temps for 1792, pa. 206, &c.

PRECIE. In botany. Early ripe. The name of an early sort of grape in Virgil. The fifty-first order in Linneus's Fragments; and the twenty-first in his Natural Orders: comprehending such plants as flower early in the spring.

PRECINCT. *s.* (*precinctus*, Latin.) Outward limit; boundary (*Hooker*).

PRECIOUSITY. *s.* (from *pretiosus*, Latin.) 1. Value; preciousness: not used. 2. Any thing of high price: not used (*More*).

PRECIOUS. *a.* (*precieux*, Fr. *pretiosus*, Lat.) 1. Valuable; being of great worth (*Ad-dison*). 2. Costly; of great price (*Milton*).

PRECIOUSLY. *ad.* (from *precious*.) Valuably; to a great price.

PRECIOUSNESS. *s.* (from *precious*.) Valuableness; worth; price (*Wilkins*).

PRECIPICE. *s.* (*præcipitium*, Latin.) A headlong steep; a fall perpendicular (*Sandys*).

PRECIPITANCE. PRECIPITANCY. *s.* (from *precipitant*.) Rash haste; headlong hurry (*Milton*).

PRECIPITANT. *a.* (*precipitans*, Latin.) 1. Falling or rushing headlong (*Phillips*). 2. Hasty; urged with violent haste (*Pope*). 3. Rashly hurried (*King Charles*).

PRECIPITANTLY. *ad.* (from *precipitant*.) In headlong haste; in a tumultuous hurry.

To **PRECIPITATE.** *v. a.* (*præcipito*, Lat.) 1. To throw headlong (*Wilkins*). 2. To urge on violently (*Dryden*). 3. To hasten unexpectedly (*Harvey*). 4. To hurry blindly or rashly (*Bacon*). 5. To throw to the bottom. A term of chemistry opposed to *sublime* (*Grew*).

To **PRECIPITATE.** *v. n.* 1. To fall headlong (*Shakspeare*). 2. To fall to the bottom

as a sediment (*Bacon*). 3. To hasten without just preparation (*Bacon*).

PRECIPITATE. *a.* (from the verb.) 1. Steeply falling (*Raleigh*). 2. Headlong; hasty; rashly hasty (*Clarend.*). 3. Hasty; violent (*Arbuthnot*).

PRECIPITATE, in chemistry, (*heeder-schlag*, Germ.) In a more limited and appropriate sense a substance thrown down from its solution in a menstruum by the application of a third or additional material, which detaches it, either by a greater affinity to itself or to the menstruum with which it has thus far been combined. (See the article **PRECIPITATION**.) It is necessary, however, for the name of a precipitate in this restricted sense, that the substance thus subsiding should fall in a flocculent or pulverulent form, since if the different particles unite in an angular polyhedral figure it will be a crystallization.

The term, however, is often used in a more extended sense to impart any visible substance, simple or compound, separated from its menstruum whether it sink or swim, or whether it be a crystal or a powder; and in this view precipitation forms one of the great operations in chemistry, and instead of being opposed to the phenomenon of crystallization, is directly opposed to that of solution. It is chiefly from the process of precipitation, as Berthollet has shown in his valuable essays on chemical statics, that philosophers have been led to deduce the supposed order of affinities between different substances.

The precipitates of most importance to attend to are those which occur in the case of acids, alkalies, or earths, and those in the case of metals and metallic compounds. We shall subjoin from Berthollet a few observations upon both these, connected with remarks offered by the Messrs. Aikin.

Among the former there are two principal kinds of precipitates which have been distinguished in chemistry; one, where to a compound produced by an acid and a base, each highly soluble in water, another acid is added which has a great affinity with the base, and forms with it a compound less soluble than the first. In this case the precipitate (which is sometimes but not always crystallized) is composed of the acid last added, in proportions that do not essentially vary. As for example, when sulphuric acid is added to a saturated solution of nitrat of potash a crystallized precipitate of sulphat of potash is produced, the proportions of which scarcely vary in any circumstances, though the actual quantity of precipitate is determined by the quantity of water and of sulphuric acid present.

The second kind of precipitate is that which has been usually supposed to be simple, and which takes place when to a compound of an acid and a base, insoluble or nearly so in water, an alkali or soluble earth is added, which by elective affinity unites with the acid and displaces the former base: and this latter now supposed to be uncombined, and insoluble in the quantity of liquid present, falls to the bot-

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om. This kind of precipitation is constantly resorted to when we wish to obtain the simple earths, as in adding an alkali to a solution of alum in order to precipitate the alumine, to Epsom salts to precipitate magnesia, &c. But the precipitate in all such cases is not (as has been usually supposed) the simple earth, since it always retains after the first operation a small and variable portion of the acid with which it was before combined. Thus, if the alumine, however well edolcorated, be re-dissolved in muriatic acid, and a salt of barytes be added, there will be a sensible precipitate of sulphat of barytes. This retention of acid is variable, and may be reduced to an insensible quantity, if not absolutely taken away by subsequent digestion in very concentrated alkali. Such precipitations therefore are not effected merely by simple affinity, but by a division of the acid into two portions, one of which, and by much the largest, goes to the alkali, and the other remains with the earth, and accompanies it in its precipitation. Even when no precipitation occurs, the acid may be proved to distribute itself in this manner; for as Bergman has remarked, if a calcareous salt be dissolved in fifty times its weight of water and an excess of potash or soda be added, no precipitation takes place, so that the acid continues in part to act upon the lime, and renders it soluble in a much less quantity of water than the lime alone would require for solution.

It may be assumed, therefore, as a general principle, and one that is of great importance in the explanation of chemical decomposition, that when a salt is composed of an acid and a base, insoluble, or little soluble by itself, the decomposition effected by any soluble base is the result not of a simple but a compound action, in which, on the one hand, the decomposing base unites with more or less of the acid and remains in solution, while the other base resumes its insolubility by the separation of part of its acid, and forms a precipitate with the remainder.

This observation will be found to apply still more strikingly in the formation of metallic precipitates, and of those salts which (like the subsulphat of mercury or turbith) were formerly taken for simple oxyds, but are now found to be salts with excess of oxyd.

The metal of any metallic solution in any acid is always in the state of an oxyd, so that the solution must contain at least three substances, the acid, the metal, and oxygen united with the metal. But the proportion of the latter is subject to a great number of variations, and is different both with the several metals and with the same metal in different circumstances.

A metallic solution may be decomposed and its metallic part precipitated either in the reguline state or as an oxyd; and these two methods which have been adopted in the analysis of metallic bodies require to be considered separately.

When a carbonated alkali is added to a metallic solution the precipitate is a carbonated

oxyd of the metal, and like the other carbonats, effervesces on the addition of a stronger acid. But when a pure acid is added only to saturation the precipitate is in some instances nearly a pure oxyd, but in the greater number is an oxyd retaining a small proportion of the acid with which it was united. This acid, however, is not sufficient to render it soluble, and it may be generally entirely taken away by subsequent digestion in a concentrated fixed alkali, provided the oxyd is not soluble therein. Hence the first action of alkalies on most metallic solutions is to cause an unequal division of the acid, the greater part of which unites with the alkali, and the remainder falls down along with the oxyd now rendered insoluble. If ammonia be the alkali employed there is also in general a partition of the alkali, and the precipitate is a quadruple compound of the metal, the oxygen united with it, and a small portion of the acid, and of the ammonia; and the solution contains the greater part of the acid of the alkali, and often a small part of the metallic oxyd sufficient to be very sensible to the taste and to chemical tests. According to Proust, lime also, when used as a precipitant, enters in a small proportion into the precipitate.

Metallic solutions sometimes yield precipitates on the mere addition of water, by the simple distribution of the constituents into two portions, a soluble and an insoluble one, the former of which has an excess of acid, and the latter of oxyd. Thus when the clear nitrat of bismuth is diluted with water a white precipitate falls down, which is chiefly oxyd of bismuth, and the supernatant liquor contains an excess of acid and a small portion of metal, which may be separated by evaporation, or by an alkali. In like manner, if sulphuric acid and mercury be treated together, sulphureous acid is given out, and the white mass that remains is an uniform acid sulphat which deliquesces into a dense solution. But if hot water be added, the turbeth or yellow subsulphat of mercury is precipitated, and the solution contains an acid sulphat.

The second species of metallic precipitates are those in which the metal appears in its reguline form. This takes place when one metal is precipitated by another, as when a piece of iron is immersed in a solution of copper, and also when phosphorus is kept for some time in certain metallic solutions.

Before the discovery of oxygen, and of the oxydation of metals being necessary to their solution in acids, the precipitation of one metal by another was supposed to be produced by simple elective attraction; and the respective affinities of the metals for the acids was put down in the order of the precipitations which they produced. But this explanation, though true in general, does not explain a number of apparent anomalies in metallic precipitation, so that we must take into consideration the force of other agents and other affinities.

The order of the precipitation of one metal by another is the following among those that have been most accurately examined,—zinc, iron,

lead, tin, copper, silver, mercury, gold: that is to say, zinc precipitates all the other metals; iron precipitates all but zinc; lead all but zinc and iron, &c.

But sometimes the precipitation fails with solutions in one acid though it succeeds in others: thus zinc separates iron in the metallic state from muriatic acid, but only as an oxyd from the nitric. A small excess of acid is necessary to begin the process in all cases.

During this operation the following affinities must act, namely, that of the precipitant (or metal by which the separation is effected) for the oxygen of the metal already dissolved; that of the oxyd thus produced for the acid of the solution; and to this Berthollet adds, that of the two metals for each other when in the reguline state. The sum of these affinities must overcome that which exists between the constituent parts of the metallic salt intended to be decomposed.

The metals which phosphorus separates from their solutions in the reguline state are principally gold, silver, mercury, and copper. Thus if a stick of clean newly-melted phosphorus be immersed in an acidulated solution of sulphat of copper, in a day or two it becomes beautifully spangled with little knobs of bright metallic copper which gradually increase to a thick crust, after which if the stick be put into boiling water the phosphorus will melt out and leave a delicate hollow cylinder of copper.

PRECIPITATELY. *ad.* (from *precipitate*.) 1. Headlong; steeply down. 2. Hastily; in blind hurry (*Pope*).

PRECIPITATION. *s.* (from *precipitate*.) 1. The act of throwing headlong (*Shakspeare*). 2. Violent motion downward (*Woodward*). 3. Tumultuous hurry; blind haste (*Woodward*).

PRECIPITATION. (from *præcipito*, to cast down.) In chemistry. When two bodies are united, for instance, an acid and an oxyd, or metallic calx, and a third body is added, such as an alkali, which has a greater affinity with the acid than the metallic oxyd, the consequence is, that the alkali combines with the acid, and the oxyd, thus deserted, appears in a separate state at the bottom of the vessel in which the operation was performed. This decomposition is commonly known by the name of precipitation, and the substance that sinks is named a precipitate. The substance, by the addition of which the phenomenon is produced, is denominated the precipitant.

By this operation, bodies are recovered from their solution, by means of the addition of some other substance, with which either the menstruum or the body dissolved have a greater affinity than they have with each other.

Precipitation, therefore, is of two kinds; one, where the substance superadded unites with the menstruum, and occasions that which was before dissolved to be thrown down; the other, in which it unites with the dissolved body, and falls with it to the bottom. Of the first, we have an example in the precipitation of sulphur from alkaline lixivium, by the means

of acids; of the second, in the precipitation of mercury from aquafortis by the muriatic acid.

The subjects of this operation, as well those which are capable of being precipitated, as those which precipitate, will readily appear by the Table of Attractions.

The manner of performing it is so simple, as to need no particular directions. All that is required, is to add the precipitant by degrees, as long as it continues to occasion any precipitation. When the whole of the powder has fallen, it is to be well edulcorated, that is, washed in several fresh parcels of water, and afterwards dried for use.

When metals are employed as precipitants, as in the purification of martial vitriol from copper by the addition of fresh iron, they ought to be perfectly clean, and free from any rusty or greasy matter, otherwise they will not readily, if at all, dissolve, and consequently the precipitation will not succeed; for the substance to be precipitated separates only by the additional one dissolving and taking its place. The separated powder, often, instead of falling to the bottom, lodges upon the precipitant, from which it must be occasionally shaken off, for reasons sufficiently obvious.

Though, in this operation, the precipitated powder is generally the part required for use, yet some advantage may be frequently made of the liquor remaining after the precipitation. Thus, when fixed alkaline salt is dissolved in water and sulphur dissolved in this lixivium, the addition of acids separates and throws down the sulphur, only in virtue of the acid uniting with, and neutralizing the alkali by which the sulphur was held dissolved; consequently, if the precipitation be made with the vitriolic acid, and the acid gradually dropt in till the alkali be completely saturated, that is, as long as it continues to occasion any precipitation or turbidness, the liquor will yield, by proper evaporation and crystallization, a neutral salt, composed of the vitriolic acid and fixed alkali, that is, vitriolated tartar. In like manner, if the precipitation be made with the nitrous acid, a true nitre; if with the muriatic, the salt called cubic nitre; and if with the acid of vinegar, the kali acetatum.

PRECIPITOUS. *a.* (*præcipitis*, Latin.) 1. Headlong; steep (*King Charles*). 2. Hasty; sudden (*Evelyn*). 3. Rash; Heady (*Dryden*).

PRECISE. *a.* (*præcisus*, Latin.) 1. Exact; strict; nice; having strict and determinate limitations (*Hooker*). 2. Formal; finical (*Addison*).

PRECISELY. *ad.* (from *precise*.) 1. Exactly; nicely; accurately (*Newton*). 2. With superstitious formality; with too much scrupulosity.

PRECISENESS. *s.* (from *precise*.) Exactness; rigid nicety (*Watts*).

PRECISION. *s.* (from *precise*.) 1. One who limits or restrains (*Shakspeare*). 2. One who is superstitiously rigorous (*Watts*).

PRECISION. *s.* (*precision*, French.) Exact limitation (*Pope*).

PRECISIVE. *a.* (from *precisus*, Latin.) Exactly limiting (*Watts*).

TO PRECLUDE. *v. n.* (*præcludo*, Latin.) To shut out or hinder by some anticipation (*Pope*).

PRECOCIOUS. *a.* (*præcociis*, Latin; *precoce*, French.) Ripe before the time (*Br.*).

PRECOCITY. *s.* (from *precocious*.) Ripeness before the time (*Howel*).

TO PRECOGITATE. *v. á.* (*præcogito*, Latin.) To consider or scheme beforehand.

PRECOGNITION. *s.* (*præ* and *cognitio*, Latin.) Previous knowledge; antecedent examination.

PRECONCEIT. *s.* (*pre* and *conceit*.) An opinion previously formed (*Hooker*).

TO PRECONCEIVE. *v. a.* (*pre* and *conceive*.) To form an opinion beforehand; to imagine beforehand (*South*).

PRECONCEPTION. *s.* (*pre* and *conception*.) Opinion previously formed (*Hakewill*).

PRECONTRACT. *s.* (*pre* and *contract*.) A contract previous to another (*Shakspeare*).

TO PRECONTRACT. *v. a.* To contract or bargain beforehand (*Ayliffe*).

PRECOP, or **PEREKOP**, a town and fortress of Russia, in the government of Catharienslaf, and province of Taurida, seated on the isthmus that joins the Crimea to the continent. A deep trench, four miles in length, is cut across the isthmus, over which is a bridge, and upon that a vaulted gate, called the Golden Gate of the Tartars. The town is now reduced to about 60 wooden houses; and its only riches consist of the salt works in its vicinity. It is 65 miles S.E. of Cherson. Lon. 35. 34 E. Lat. 46. 8 N.

PRECORDIA, in anatomy, a general name for the parts situated about the heart, in the forepart of the thorax; as the diaphragm, pericardium, and even the heart itself, with the spleen, lungs, &c.

PRECURSE. *s.* (from *præcurro*, Latin.) Forerunning (*Shakspeare*).

PRECURSOR. *s.* (*præcursor*, Latin.) Forerunner; harbinger (*Pope*).

PREDACEOUS. *a.* (from *præda*, Latin.) Living by prey (*Derham*).

PREDAL. *a.* (from *præda*, Latin.) Robbing; practising plunder (*Sa. Boyse*).

PREDATORY. *a.* (*predatorius*, Latin.)

1. Plundering; practising rapine (*Bacon*).

2. Hungry; preying; rapacious; ravenous (*Bacon*).

PREDECEASED. *a.* (*pre* and *deceased*.) Dead before (*Shakspeare*).

PREDECESSOR. *s.* (*predecessor*, Fr.)

1. One that was in any state or place before another (*Prior*). 2. Ancestor.

PREDESTINARIAN. *s.* (from *predestinate*.) One that holds the doctrine of predestination (*Decay of Piety*).

TO PREDESTINATE. *v. a.* (*predestiner*, French.) To appoint beforehand by irreversible decree (*Shakspeare*).

TO PREDESTINATE. *v. n.* To hold predestination. In ludicrous language (*Dryden*).

PREDESTINATION, the decree of God, whereby he is supposed to have, from all eternity, unchangably appointed whatsoever comes to pass; and hath more especially fore-ordained certain individuals of the human race to everlasting happiness, and hath passed by the rest, and fore-ordained them to everlasting misery. The former of these are called the elect, and the latter are called the reprobate.

This doctrine is the subject of one of the most perplexing controversies that has occurred among mankind. But it is not altogether peculiar to the Christian faith. The opinion, that whatever occurs in the world at large, or in the lot of private individuals, is the result of a previous and unalterable arrangement by that Supreme Power which presides over nature, has always been a favourite opinion among the vulgar, and has been believed by many speculative men.

The ancient Stoics, Zeno and Chrysippus, whom the Jewish Essenes seem to have followed, asserted the existence of a Deity that, acting wisely, but necessarily, contrived the general system of the world; from which, by a series of causes, whatever is now done in it unavoidably results. This series or concatenation of causes, they held to be necessary in every part; and that God himself is so much the servant of necessity and of his own decrees, that he could not have made the smallest object in the world otherwise than it now is, much less is he able to alter any thing.

According to the words of Seneca, “Eadem necessitas et Deos alligat. Irrevocabilis divina pariter atque humana cursus vehit. Ille ipse omnium condito ac rector scripsit quidem fata sed sequitur. Semper parat, semel jussit.”

“The same chain of necessity constrains both gods and men. Its unalterable course regulates divine as well as human things. Even he who wrote the Fates, the Maker and Governor of all things, submits to them. He did but once command, but he always obeys.” The stoical fate differs, however, from the Christian predestination in several points. They regard the divine nature and will as a necessary part of a necessary chain of causes; whereas the Christians consider the Deity as the Lord and Ruler of the Universe, omnipotent and free, appointing all things according to his pleasure. Being doubtful of the immortality of the soul, the Stoics could have no idea of the doctrine of election and reprobation; nor did they ever doubt their own freedom of will, or power of doing good as well as evil, as we shall presently see the Christian predestinarians have done.

Mahomet introduced into his Koran the doctrine of an absolute predestination of the course of human affairs. He represented life and death, prosperity and adversity, and every event that befalls a man in this world, as the result of a previous determination of the one God who rules over all; and he found this opinion the best engine for inspiring his followers with

P R E D E S T I N A T I O N .

that contempt of danger which, united to their zeal, has extended the empire of their faith over the fairest portion of the habitable globe.

The controversy concerning predestination first made its appearance in the Christian church about the beginning of the fifth century. See Mosheim's Instit. Hist. Eccl. Pelagius a British, and Celestius an Irish monk, who both lived at Rome during that period, and were with justice celebrated for their exemplary piety, and integrity, and great learning, contended that the doctrines of predestination and original sin were false. On the contrary, the famous Augustine, bishop of Hippo, strenuously asserted the depravity of human nature since the fall of the first man, the necessity of a special interposition of divine grace to enable us to do any one good action; and, consequently, that none could obtain salvation excepting those whom God has thought fit to elect, and upon whom he bestows this grace. In the course of the same century these opinions assumed a variety of forms and modifications. One party, called Predestinarians, carried Augustine's doctrine fully further than he himself had ventured to do in express words; and asserted, that God had not only predestinated the wicked to punishment, but also that he had decreed that they should commit those very sins on account of which they are hereafter to be punished. Another party moderated the doctrine of Pelagius, and were called Semipelagians. Their peculiar opinion is expressed in a different manner by different writers; but all the accounts sufficiently agree. Thus, some represent them as maintaining that inward grace is not necessary to the first beginning of repentance, but only to our progress in virtue. Others said that they acknowledge the power of grace, but held that faith depends upon ourselves, and good works upon God; and it is agreed upon all hands, that these Semipelagians held that predestination is made upon the foresight of good works. The assistance of Augustine, though then far advanced in life, was called in to combat these tenets, and he wrote several treatises upon the subject. In all these he strenuously maintained, that the predestination of the elect was independent of any foresight of their good works, but was according to the good pleasure of God only; and that perseverance comes from God, and not from man. Thereafter the doctrine of Augustine, or St. Austin as he is often called, became general. He was the oracle of schoolmen. They never ventured to differ from him in sentiment: they only pretended to dispute about the true sense of his writings.

The whole of the earliest reformers maintained these opinions of Augustine. They assumed under Luther a more regular and systematic form than they had ever formerly exhibited. But as the Lutherans afterwards abandoned them, they are now known by the name of Calvinistic Doctrines, from John Calvin, of Geneva. He asserted, that the everlasting condition of mankind in a future world was

determined from all eternity by the unchangeable decree of the Deity, arising from his sole good pleasure or free will.

There are two kinds of Calvinists or Predestinarians, viz. the Supralapsarians, who maintain that God did originally and expressly decree the fall of Adam, as a foundation for the display of his justice and mercy; while those who maintain that God only permitted the fall of Adam are called Sublapsarians, their system of decrees concerning election and reprobation being, as it were, subsequent to that event. But, as Dr. Priestley justly remarks, if we admit the divine prescience, there is not, in fact, any difference between the two schemes; and accordingly that distinction is now seldom mentioned.

The points chiefly at issue between the Calvinists and Arminians are the following.—First, with what views and purposes did God create the world and frame his decrees concerning mankind? Did he contrive a great unalterable scheme of creation and providence only for the sake of manifesting his own glory and perfections? Or did he first consider the free motions of those rational agents whom he intended to create, and frame his decrees upon the consideration of what they might choose or do in all the various circumstances in which he intended to place them? The second and following questions are branches of this leading one.—Did Christ die for a particular portion of the human race, who shall therefore certainly be saved? or was his death intended as a benefit to all, from which none are excluded excepting those who willingly reject it? Is the divine grace certainly and irresistibly efficacious in all those minds to which it is given? or does its effect depend upon the good use which men may or may not make of it? Can any good action be done without it? Do those who have once received it certainly persevere and obtain salvation? or is it possible for any of them to fall away and perish finally? These are questions the discussion of which would lead us far beyond our usual limits, and the tediousness of it would hardly be compensated by any prospect of utility.

The weak side of the Calvinistic doctrine consists in the impossibility of reconciling the absolute and unconditional decree of reprobation with our ideas of the justice and goodness of God. The weak side of the Arminian scheme consists in the difficulty of accounting for the certainty of the divine foreknowledge, upon the supposition of a contingency of events, or an absolute freedom of will in man.

To elude the former of these difficulties, some of the late writers upon philosophical necessity, and Dr. Priestley is among the number, have given up the doctrine of reprobation, and asserted that this world is only a state of preparation for another, in which all men of every description and character shall attain to final and everlasting happiness, when God shall be all, and in all. On the other side, some of the supporters of free agency, and

Montesquieu is among the number, have been disposed to deny the divine attribute of prescience.

Whatever may be thought of the practical tendency of the two most prevailing opinions, there is one remark which we think ourselves bound in justice to make, although it appears to us to be somewhat singular. It is this, that from the earliest ages down to our own days, if we consider the character of the ancient Stoics, the Jewish Essenes, the modern Calvinists, and Jansenists, when compared with that of their antagonists the Epicureans, the Saducees, Arminians and the Jesuits, we shall find that they have excelled in no small degree in the practice of the most rigid and respectable virtues, and have been the highest honour of their own ages, and the best models for imitation to every age succeeding. At the same time, it must be confessed, that their virtues have often been rendered unamiable by a tinge of gloomy and severe austerity.

So far as the speculative foundation of their principles is considered, however, neither party seems liable to censure in a moral point of view. Each of them wishes to support, though in a different manner from the other, the honour of the divine character. The Calvinists begin their argument with the notion of infinite perfection, independency, and absolute sovereignty, and thence deduce their opinions; making every difficulty yield to these first and leading ideas. Their opponents are more jealous of the respect due to the divine attributes of justice, truth, holiness, and mercy, and deduce their sentiments from the idea which they have formed of these. Each party lays down general maxims that are admitted by the other, and both argue plausibly from their first principles. These are strong grounds for mutual charity and forbearance. For our own parts, we have long been of opinion that there is an intermediate point between these opposed systems, in which all that is good in both will be found to meet, and all that is objectionable excluded.

PREDESTINATOR. *s.* (from *predestinate*.) One that holds predestination or the prevalence of preestablished necessity (*Cowley*).

To PREDESTINE. *v. a.* (*pre* and *destine*.) To decree beforehand.

PREDETERMINATION. *s.* (*predetermination*, French.) Determination made beforehand (*Hammond*).

To PREDETERMINE. *v. a.* (*pre* and *determine*.) To doom or confine by previous decree; to judge or settle principles (*Hale*).

PRE'DIAL. *a.* (*prædium*, Latin.) Consisting of farms (*Ayliffe*).

PRE'DICABLE. *a.* (*predicable*, French; *predicabilis*, Latin.) Such as may be affirmed of something.

PRE'DICABLE. *s.* (*prædicabile*, Latin.) A logical term, denoting one of the five things which can be affirmed of any thing (*Watts*).

PREDICAMENT. *s.* (*predicament*, Fr. *prædicamentum*, Latin.) 1. A class or arrange-

ment of beings or substances ranked according to their natures: called also *catagorema* or *catagory* (*Harris*). 2. Class or kind described by any definite marks (*Shakspeare*).

PREDICAMENTAL. *a.* (from *predicament*.) Relating to predicaments.

PREDICANT. *s.* (*prædicans*, Latin.) One that affirms any thing.

To PRE'DICATE. *v. a.* (*prædico*, Latin.) To affirm any thing of another thing (*Locke*).

To PRE'DICATE. *v. n.* To affirm; to comprise an affirmation (*Hale*).

PREDICATE. *s.* (*prædicatum*, Latin.) That which is affirmed or denied of the subject: as, *man is rational*; *man is not immortal*.

PREDICA'TION. *s.* (*predicatio*, Latin.) Affirmation concerning any thing (*Locke*).

To PREDICT. *v. a.* (*prædictus*, Latin.) To foretell; to foreshow (*Gov. of the Tongue*).

PREDI'CTION. *s.* (*predictio*, Latin.) Prophecy; declaration of something future (*South*).

PREDI'CTOR. *s.* (from *predict*.) Foreteller.

PREDIGESTION. *s.* (*pre* and *digestion*.) Digestion too soon performed (*Bacon*).

To PREDISPOSE. *v. a.* (*pre* and *dispose*.) To adapt previously to any secret purpose (*South*).

PREDISPOSING CAUSE. (*causa prædugmena*.) In medicine. That which renders the body susceptible of disease. The most frequent predisposing causes of diseases are, the temperament and habit of the body, idiosyncrasy, age, sex, and structure of the part diseased.

PREDISPOSITION. (*prædispositio*.) In medicine. That constitution or state of the solids or fluids, or of both, which disposes the body to the action of disease.

PREDISPOSITION. *s.* (*pre* and *disposition*.) Previous adaptation to any certain purpose (*Wiseman*).

PREDOMINANCE. **PREDOMINANCY.** *s.* (*præ* and *dominor*, Latin.) Prevalence; superiority; ascendancy; superiour influence (*Shakspeare*, *Brown*).

PREDOMINANT. *a.* (*predominant*, Fr.) Prevalent; supreme in influence; ascendant (*Shakspeare*).

To PRE'DOMINATE. *v. n.* (*predominer*, French.) To prevail; to be ascendant; to be supreme in influence (*Newton*).

To PRE'ELECT. *v. a.* (*pre* and *elect*.) To choose by previous decision.

PREE'MINENCE. *s.* (*preeminence*, Fr.) 1. Superiority of excellence (*Addison*). 2. Precedence; priority of place (*Hooker*). 3. Superiority of power or influence (*Brown*).

PREE'MINENT. *a.* (*preeminent*, French.) Excellent above others (*Sprat*).

PREEMPTION. *s.* (*præemptio*, Latin.) The right of purchasing before another (*Carew*).

To PREEN. *v. a.* (*pruinen*, Dutch.) To trim the feathers of birds, to enable them to glide more easily through the air (*Bailey*).

To PREENGA'GE. *v. a.* (*pre* and *engage*.)

P R E

To engage by precedent ties or contracts (Rogers).

PREENGAGEMENT. *s.* (from *preengage*.) Precedent obligation (Boyle).

To PREESTABLISH. *v. a.* (*pre* and *establish*.) To settle beforehand.

PREESTABLISHMENT. *s.* (from *preestablish*.) Settlement beforehand.

To PREEXIST. *v. a.* (*præ* and *existo*, Latin.) To exist beforehand (Dryden).

PREEXISTENCE. *s.* (*preexistence*, Fr.) 1. Existence before (Burnet). 2. Existence of the soul before its union with the body (Addison).

PREEXISTENT. *a.* (*preexistent*, French.) Existing beforehand; preceding in existence (Pope).

PREFACE. *s.* (*preface*, French.) Something spoken introductory to the main design; introduction; something proemial (Peacham).

To PREFACE. *v. n.* (*præfari*, Lat.) To say something introductory (Spectator).

To PREFACE. *v. a.* 1. To introduce by something proemial (Southern). 2. To face; to cover (Cleaveland).

PREFACER. *s.* (from *preface*.) The writer of a preface (Dryden).

PREFATORY. *a.* (from *preface*.) Introductory (Dryden).

PREFECT, in ancient Rome, one of the chief magistrates who governed in the absence of the kings, consuls, and emperors. This power was greatest under the emperors. His chief care was the government of the city, taking cognizance of all crimes committed therein and within 100 miles.

PREFECTURE. *s.* (*prefecture*, French; *præfectura*, Latin.) Command; office of government.

To PREFER. *v. a.* (*preferer*, French. *præfero*, Latin.) 1. To regard more than another (Romans). 2. To advance; to exalt; to raise (Clarendon). 3. To present ceremoniously (Pope). 4. To offer solemnly; to propose publicly; to exhibit (Sandys).

PREFERABLE. *a.* (*preferable*, French; from *prefer*.) Eligible before something else (Locke).

PREFERABLENESS. *s.* (from *preferable*.) The state of being preferable.

PREFERABLY. *ad.* (from *preferable*.) In preference; in such a manner as to prefer one thing to another (Dennis).

PREFERENCE. *s.* (*preference*, Fr. from *prefer*.) The act of preferring; estimation of one thing above another; election of one rather than another (Sprat).

PREFERER. *s.* (from *prefer*.) One who prefers.

PREFERMENT. *s.* (from *prefer*.) 1. Advancement to a higher station (Shakspeare). 2. A place of honour or profit (L'Estrange). 3. Preference; not in use (Brown).

To PREFIGURATE. *v. a.* (*præ* and *figuro*, Latin.) To show by an antecedent representation.

PREFIGURATION. *s.* (from *prefigure*.) Antecedent representation (Norris).

P R E

To PREFIGURE. *v. a.* (*præ* and *figuro*, Latin.) To exhibit by antecedent representation (Hammond).

To PREFINE. *v. a.* (*præfino*, Latin.) To limit beforehand (Knolles).

To PREFIX. *v. a.* (*præfigo*, Latin.) 1. To appoint beforehand (Sandys). 2. To settle; to establish (Hale). 3. To put before another thing: as, he prefixed an advertisement to his book.

PREFIX. *s.* (*præfixum*, Latin.) Some particle put before a word, to vary its significance (Brown).

PREFIXION. *s.* (*prefixion*, Fr. from *prefix*.) The act of prefixing.

To PREFORM. *v. a.* (*pre* and *form*.) To form before hand; not in use (Shakspeare).

PREGNANCY. Utero gestation. The particular manner in which pregnancy takes place has hitherto remained involved in obscurity, notwithstanding the laborious investigation of the most eminent philosophers of all ages.

Although pregnancy is a state which (with a few exceptions) is natural to all women, it is in general the source of many disagreeable sensations, and often the cause of diseases, which might be attended with the worst of consequences if not properly treated.

It is now, however, universally acknowledged, that those women who bear children enjoy, usually, more certain health, and are much less liable to dangerous diseases, than those who are unmarried, or who prove barren. See MIDWIFERY.

PREGNANT. *a.* (*pregnans*, Latin.) 1. Teeming; breeding (Prior). 2. Fruitful; fertile; impregnating (Dryden). 3. Full of consequence (Woodward). 4. Evident; plain; clear; obsolete (Shak.). 5. Easy to produce any thing (Shak.). 6. Free; kind; obsolete (Shakspeare).

PREGNANTLY. *ad.* 1. Fruitfully. 2. Fully; plainly; clearly (Shakspeare).

PREGUSTATION. *s.* (*præ* and *gusto*, Latin.) The act of tasting before another.

PREHENSILE, or PRENSILE, in zoology, a term applied to the tails of animals when they have the power of coiling them round other substances and suspending their bodies by them.

To PREJUDGE. *v. a.* (*prejurer*, French.) To determine any question beforehand; generally to condemn beforehand (Swift).

To PREJUDICATE. *v. a.* (*præ* and *judico*, Latin.) To determine beforehand to disadvantage (Sandys).

PREJUDICATE. *a.* (from the verb.) 1. Formed by prejudice; formed before examination (Watts). 2. Prejudiced; prepossessed by opinions (Brown).

PREJUDICATION. *s.* (from *prejudicate*.) The act of judging without examination.

PREJUDICE. *s.* (*prejudice*, French; *prejudicium*, Latin.) 1. Prepossession; judgment formed beforehand without examination (Clarendon). 2. Mischief; detriment; hurt; injury (Bacon).

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PREJUDICE, or PREJUDGMENT, from *præ* and *judicium*, means a judgment formed beforehand, without examination; the preposition *præ* expressing an anticipation, not so much of time as of knowledge and due attention: hence the schoolmen have called it anticipation and a preconceived opinion.

Prejudice arises from the associating principle, and it is a weakness from which no human mind can be wholly free. Some are indeed much more than others under its influence; but there is no man who does not occasionally act upon principles, the propriety of which he never investigated; or who does not hold speculative opinions, into the truth of which he never seriously enquired. Our parents and tutors, yea our very nurses, determine a multitude of our sentiments: our friends, our neighbours, the custom of the country where we dwell, and the established opinions of mankind, form our belief; the great, the pious, the learned, and the ancient, the king, the priest, and the philosopher, are characters of mighty efficacy to persuade us to regulate our conduct by their practice, and to receive as truth whatever they may dictate.

The case cannot indeed be otherwise. The occasions of acting are so frequent, and the principles of action are so various, that were a man to investigate accurately the value of every single motive which presents itself to his mind, and to balance them fairly against each other, the time of acting would in most instances pass away long before he could determine what ought to be done; and life would be wasted in useless speculation. The great laws of religion and morality, which ought to be the general and leading principles of action, no man of science will take upon trust; but in the course of a busy life a thousand circumstances will occur in which we must act with such rapidity, that, after being satisfied of the lawfulness of what we are about to do, we must, for the prudence of it, confide entirely in the general customs of our country, or in the practice of other individuals placed in circumstances similar to ours. In all such cases, though we may act properly, we act from prejudice.

But the dominion of prejudice is not confined to the actions of the man of business: it extends over the speculations of the philosopher himself, one half of whose knowledge rests upon no other foundation. All human sciences are related to each other (see *PHILOSOPHY*), and there is hardly one of them in which a man can become eminent unless he has some general acquaintance with the whole circle; but no man could ever yet investigate for himself all those propositions which constitute the circle of the sciences, or even comprehend the evidence upon which they rest, though he admits them perhaps as truths incontrovertible. He must therefore receive many of them upon the authority of others, or, which is the same thing, admit them by prejudice.

To this reasoning it may be objected, that

when a man admits as true abstract propositions, which, though not self-evident, he cannot demonstrate, he admits them not by prejudice, but upon testimony, which has been elsewhere shown to be a sufficient foundation for human belief. The objection is plausible, but it is not solid; for testimony commands belief only concerning events, which, falling under the cognizance of the senses, preclude all possibility of mistake; whereas abstract propositions, not self evident, can be proved true only by a process of reasoning or by a series of experiments; and in conducting both these, the most vigorous mind is liable to mistake. When sir Isaac Newton told the world that it was the fall of an apple which first suggested to him the general law of gravitation, he bore testimony to a fact concerning which he could not be mistaken; and we receive his testimony for the reasons assigned in the article referred to. When he lays down the method of obtaining the fluxion or moment of the rectangle or product of two indeterminate quantities, which is the main point in his doctrine of fluxions, he labours to establish that method on the basis of demonstration; and whoever makes use of it in practice, without understanding that demonstration, receives the whole doctrine of the modern geometrical analysis, not as a matter of fact upon the credit of sir Isaac's testimony, but as a system of abstract truth on the credit of his understanding: in other words he is a fluxionist by prejudice.

In vain will it be said, that in mathematical demonstration there is no room for mistake; and that therefore the man who implicitly adopts the method of fluxions may be considered as relying upon the veracity of its author, who had no inducement to deceive him, and whose comprehension was confessedly greater than his. In fluxionary mathematics, which treat of matters of which it is extremely difficult, if not impossible, to have adequate and steady conceptions, the most comprehensive mind is liable to mistake; and it is well known that the celebrated bishop of Cloyne wrote his Analyst to prove that the incomparable author of the method of fluxions had committed two mistakes in his fundamental proposition, which balancing one another, produced a true conclusion by false reasoning. One or other of these great men, of whom the least was an eminent mathematician, must have been bewildered in his reasoning, and have fallen into error; and therefore whoever follows either of them implicitly without perceiving the error of the other, is unquestionably under the influence of prejudice. This was long the case with the writer of the present article. He perceived not the error of bishop Berkeley's reasoning, and yet he admitted the doctrine of fluxions on the authority of sir Isaac's demonstration. That demonstration he then did not pretend to understand; and therefore he admitted the doctrine through prejudice.

We have made these observations to point out the absurdity of the fashionable cry against the harbouring of any prejudices. To eradicate

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all prejudices from the human mind is impossible; and if it were possible, it would be very unwise: for we see that prejudice may exist on the side of truth as well as on that of falsehood; and that principles professed and believed by any individual may be useful and true, though he were brought to them not by a train of fair and candid reasoning, but through the medium of prepossession or authority. Indeed such is our nature, and such are the laws of association, that many of our best principles, and our obligation to perform many of the most amiable of our duties in common life, must evidently be acquired in this way. From endearing associations, and authoritative instruction, we acquire a knowledge of our duty to our parents, and a facility in performing it, together with the first principles of religion, without a single effort of our own reason. Even when reason has begun to assert its power and shows us the propriety of such duties, we are wonderfully assisted in performing them by the amiable prejudices which we had before acquired, and which now appear to be natural to us. He who has never had the advantage of such associations, and who acquires a knowledge of the duties suggested by them after he has come to years of discretion, and chiefly by the efforts of his own reason, will seldom, *ceteris paribus*, perform these duties with an energy and delight equal to that of the person who has. This remark appears to be confirmed by experience; for it is often found, that the children of the great, who have been given out to nurse in their infancy, and who have seldom been in the company of their parents till their reasoning faculties have been far advanced, are much less dutiful and affectionate than those in the middle or lower stations of life, who have scarcely ever been out of their parents' company.

Would it then be wise, even if it were practicable, to dissolve all those associations which tend so powerfully to increase the mutual affections of parents and children? We cannot think that it would; as we believe it might be easily shown that public spirit springs out of private affection. Plato indeed held an opinion very different from ours; for in order to extend that affection which is usually lavished at home to the whole state, he proposed that children should be educated at the public expense, and never permitted to know the authors of their being. But this is only one of the many visionary projects of that great man, of which daily experience shows the absurdity. In modern times, we are certain that less dependence is to be had upon the patriotism of the man who, for the love which he pretends to his country, can overlook or forget his own partial connections in it, than to him who, at the same time that he wishes his country well, is feelingly alive to all the endearments of kindred affection.

Such affection may be called partial, and very probably has its foundation in that which is the source of all our prejudices: but if it be properly trained in early life, it will gradually

extend from our nearest relations to the persons with whom we associate, and to the place which not only gave us birth, but also furnished our youthful and most innocent enjoyments. It is thus that the *amor patriæ* is generated, which in minds unseduced by false principles is exceedingly strong; and though a partial affection, is of the most general utility. It is this prejudice which reconciles the Laplander to his freezing snows, and the African to his burning sun; which attaches the native of the Highlands or of Wales as much to his mountains and rocks, as the apparently happier inhabitant of the southern counties of England is to the more fertile and delightful spot where he drew his first breath. And we find in fact, that when a native of Kent and a Scotch Highlander have in some distant corner of the world gained a competent fortune without being corrupted by luxury, they return, one to his hop-gardens, and the other to his mountains. Were this prejudice, for such it surely is, wholly eradicated from the human mind, it is obvious that large tracts of country which are now full of inhabitants would be totally deserted; and that the hungry barbarians, to make room for themselves, would exterminate the proprietors of more favourable climes. From an affection to our friends and to our country, we naturally contract an affection for that mode of government under which we live; and unless it be particularly oppressive to ourselves or any order of citizens, we come as naturally to prefer it to all other modes, whether it deserve that preference or not. This no doubt is prejudice, but it is a beneficial prejudice; for were the multitude, who are wholly incapable of estimating the excellencies and defects of the various modes of government, to become dissatisfied with their own, and rise in a mass to change it for the better, the most horrible consequences might justly be dreaded. Of this truth the present state of Europe affords too melancholy and convincing a proof. The man, therefore, who, under the pretence of enlightening the public mind and extirpating prejudices, paints to the illiterate vulgar, in aggravated colours, the abuse of that government which has hitherto protected them from the ferocity of each other, is one of the greatest criminals if his views be selfish, and one of the worst reasoners, if they be disinterested, that human imagination can easily conceive.

With the selfish patriot we have at present no concern, but we may with propriety ask the disinterested lover of truth, whether he thinks it possible, that in a large community, of which nine-tenths of the members are necessarily incapable of taking comprehensive views of things, or feeling the force of political reasonings, any form of government can be acceptable to the people at large, which does not gain their affections through the medium of prejudice? It has been shown by Mr. Hume, with great strength of argument, that government is founded on opinion, which is of two kinds, viz. opinion of interest, and opinion

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of right. By opinion of interest, he understands the sense of the general advantage which is reaped from government, together with the persuasion that the particular government which is established is equally advantageous with any other that could easily be settled. The opinion entertained of the right of any government is always founded in its antiquity; and hence arises the passionate regard which under ancient monarchies the people have for the true heir of their royal family. These opinions, as held by the philosopher, conversant with the history of nations, are founded upon reasoning more or less conclusive; but it is obvious, that in the minds of the multitude they can have no other foundation than prejudice. An illiterate clown or mechanic does not see how one form of government promotes the general interest more than another; but he may believe that it does, upon no other evidence than the declamation of a demagogue, who, for selfish purposes, contrives to flatter his pride. The same is the case with respect to the rights of hereditary monarchy. The anatomist finds nothing more in the greatest monarch than in the meanest peasant, and the moralist may perhaps frequently find less; but the true philosopher acknowledges his right to the sovereignty: and though he be weak in understanding, or infirm in years, would, for the sake of public peace and the stability of government, maintain him in his throne against every competitor of the most shining talents. The vulgar, however, who would act with this philosopher, are influenced by no such views, but merely by their prejudices in favour of birth and family; and therefore it is ridiculous to think of changing the public mind with respect to any form of government by pure reasoning.

The influence of prejudice is not more powerful in fixing the political opinions of men, than in dictating their religious creed. Most children of religious fathers receive their faith by inheritance long before they are capable of judging whether it be agreeable or disagreeable to the word of God and the light of reason. This experience shows to be the fact; and sound philosophy declares that it cannot be otherwise. Parents are appointed to judge for their children in their younger years, and to instruct them in what they should believe, and what they should practise in the civil and religious life. This is a dictate of nature, and doubtless would have been so in a state of perfect innocence. It is impossible that children should be capable of judging for themselves before their minds are furnished with a competent number of ideas, and before they are acquainted with any principles and rules of just reasoning; and therefore they can do nothing better than run to their parents, and receive their directions what they should believe and what they should practise.

This mode of tutoring the infant mind, and giving to our instructions the force of prejudice, before reason can operate with much effect, will, we know, be highly displeasing to many

who challenge to themselves alone the epithet of liberal. With them it will be cramping the genius and perverting the judgment: but we cannot help thinking that such an objection, if it should be made, would be the offspring of ignorance; for it requires but very little knowledge of human nature to be able to see, that if children be not restrained by authority, and if we do not insinuate a love of good principles into their minds, bad ones will insinuate themselves, and a little time will give them the force of inveterate prejudice, which all the future efforts of reason and philosophy will find it difficult to eradicate. The idea of keeping a child ignorant of the being of a God, and the grand duties of morality and religion, till he shall come to years of discretion, and then allowing him to reason them for himself, is an absurd chimæra: it is an experiment which never has been tried, which to us it appears impossible to try, and which, if it could be tried, could not possibly produce any good effect. For suppose we had a youth just arrived at years of discretion, totally ignorant of all these things, and unbiassed to any system of opinions, or rather possessed of no opinions at all—it would, in the first place, we suspect, be absolutely necessary to direct his thoughts into a particular train, and for some person to lead him on from one idea to another, till he should arrive at some conclusion: but in all this there is the influence of authority, association, and of prejudice.

It being therefore absolutely necessary that sentiments of religion be instilled into the minds of children, before they be capable of discovering by the use of their reason whether those sentiments be just or not, it need not excite wonder, nor is it any reflection upon religion, that most men adhere with bigotry to the creed of their fathers, and support that creed by arguments which could carry conviction to no minds but their own. The love and veneration which they bear to the memory of those from whom they imbibed their earliest opinions do not permit them to perceive either the falsehood of those opinions, or their little importance supposing them true. Hence the many frivolous disputes which have been carried on among christians; and hence the zeal with which some of them maintain tenets which are at once contrary to scripture, to reason, and to common sense. A due reflection, however, on the source of all prejudices, ought to moderate this zeal; for no man is wholly free from that bias which he is so ready to condemn in others: and indeed a man totally free from prejudice, would be a more unhappy being than the most violent bigot on earth. In science, he would admit nothing which he could not himself demonstrate; in business, he would be perpetually at a stand for want of motives to influence his conduct: he could have no attachment to a particular country; and therefore must be without patriotism, and without the solaces of friendship; and his religion, we are afraid, would be cold and lifeless.

What, it will be said, are the authors of a

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work which professes to enlighten the public mind by laying before it a general view of science and literature become at last the advocates of prejudice, which is the bane of science, and the prop of superstition? No, we are advocates for no prejudice which is either inimical to science or friendly to absurdity; but we do not think that the moralist would act wisely who should desert his proper business to make himself master of the higher mathematics, merely that he might not be obliged to trust occasionally to the demonstrations of others. The writer of this article is not skilled in trade; but it is not his opinion that the merchant would soon grow rich, who should never make a bargain till he had previously calculated with mathematical exactness all the probabilities of his gain or loss. That to dissolve all the associations which are the source of partial attachments of kindred, affection, and private friendship, would tend to promote the public happiness, we cannot possibly believe. And we think that the experience of the present eventful day abundantly confirms Mr. Hume's opinion, that far from endeavouring to extirpate the people's prejudices in favour of birth and family, we should cherish such sentiments, as being absolutely requisite to preserve a due subordination in society. That men would be better Christians if they were to receive no religious instruction till they should be able by their own reason to judge of its truth, daily observation does not warrant us to conclude; for we see those who have seldom heard of God when children, "live without him in the world" when they are men.

Pernicious prejudices should be prevented by proper attention in the education of children; and the earlier such attention is paid, the more effectual it will be found; for it is much easier to keep prejudices out of the mind than to remove them after they have been admitted. This, however, must be sometimes attempted; and where prejudices are strong, several methods have been recommended for rendering the attempt successful. The following are taken mostly from Dr. Watts's Improvement of the Mind.

1. Never attack the prejudice directly, but lead the person who is under its influence step by step to the truth. Perhaps your neighbour is under the influence of superstition and bigotry in the simplicity of his soul; you must not immediately run upon him with violence, and show him the absurdity or folly of his own opinions, though you might be able to set them in a glaring light; but you must rather begin at a distance, and establish his assent to some familiar and easy propositions, which have a tendency to refute his mistakes, and to confirm the truth; and then silently observe what impression this makes upon him, and proceed by slow degrees as he is able to bear, and you must carry on the work perhaps at distant seasons of conversation. The tender or diseased eye cannot bear a deluge of light at once.

Overhastiness and vehemence in arguing is oftentimes the effect of pride; it blunts the

poignancy of the argument, breaks its force, and disappoints the end. If you were to convince a person of the falsehood of the doctrine of transubstantiation, and you take up the consecrated bread before him and say, "You may see, and taste, and feel this is nothing but bread; therefore whilst you assert that God commands you to believe it is not bread, you most wickedly accuse God of commanding you to tell a lie." This sort of language would only raise the indignation of the person against you, instead of making any impressions upon him. He will not so much as think at all on the argument you have brought, but he rages at you as a profane wretch, setting up your own sense and reason above sacred authority; so that though what you affirm is a truth of great evidence, yet you lose the benefit of your whole argument by an ill management, and the unreasonable use of it.

2. Where the prejudices of mankind cannot be conquered at once, but will rise up in arms against the evidence of truth, there we must make some allowances, and yield to them for the present, as far as we can safely do it without real injury to truth; and if we would have any success in our endeavours to convince the world, we must practise this complaisance for the benefit of mankind. Take a student who has deeply imbibed the principles of the Peripatetics, and imagines certain immaterial beings, called substantial forms, to inhabit every herb, flower, mineral, metal, fire, water, &c. and to be the spring of all its properties and operations; or take a Platonist, who believes an *anima mundi*, "an universal soul of the world," to pervade all bodies, to act in and by them according to their nature, and indeed to give them their nature and their special powers; perhaps it may be very hard to convince these persons by arguments, and constrain them to yield up those fancies. Well then, let the one believe his universal soul, and the other go on with his notion of substantial forms, and at the same time teach them how by certain original laws of motion, and the various sizes, shapes, and situations of the parts of matter, allowing a continued divine concurrence in and with all, the several appearances in nature may be solved and the variety of effects produced, according to the corpuscular philosophy, improved by Descartes, Mr. Boyle, and sir Isaac Newton; and when they have attained a degree of skill in this science, they will see these airy notions of theirs, these imaginary powers, to be so useless and unnecessary, that they will drop them of their own accord. The Peripatetic forms will vanish from the mind like a dream, and the Platonic soul of the world will expire.

We may give another instance of the same practice, where there is a prejudicate fondness of particular words and phrases. Suppose a man is educated in an unhappy form of speech, whereby he explains some great doctrine of the gospel, and by the means of this phrase he has imbibed a very false idea of that doctrine; yet he is so bigotted to his form of words, that

he imagines if those words are omitted the form is lost. Now, if we cannot possibly persuade him to part with his improper terms, we will indulge them a little, and try to explain them in a scriptural sense, rather than let him go on in his mistaken ideas. A person who has been bred a Papist, knows but little of religion, yet he resolves never to part from the Roman Catholic faith, and is obstinately bent against a change. Now it cannot be unlawful to teach such an one the true Christian, i. e. the Protestant religion, out of the Epistle to the Romans, and show him that the same doctrine is contained in the Catholic Epistles of St. Peter, James, and Jude, and thus let him live and die a good Christian in the belief of the religion taught him out of the New Testament, while he imagines he is a Roman Catholic still, because he finds the doctrine he is taught in the Catholic Epistles, and in that to the Romans. Sometimes we may make use of the very prejudices under which a person labours, in order to convince him of some particular truth, and argue with him upon his own professed principles as though they were true. Suppose a Jew lies sick of a fever, and is forbid flesh by his physician; but hearing that rabbits were provided for the dinner of the family, desired earnestly to eat of them; and suppose he became impatient, because his physician did not permit him, and he insisted upon it that it could do him no hurt—surely rather than let him persist in that fancy and that desire to the danger of his life, we might tell him that these animals were strangled, a sort of food forbidden by the Jewish law, though we ourselves might believe that law to be abolished.

Where we find any person obstinately persisting in a mistake in opposition to all reason, especially if the mistake be very injurious or pernicious, and we know this person will hearken to the sentiment or authority of some favourite name; it is needful sometimes to urge the opinion and authority of that favourite person, since that is likely to be regarded much more than reason. We are almost ashamed indeed to speak of using any influence of authority in reasoning or argument; but in some cases it is better that poor, silly, perverse, obstinate creatures, should be persuaded to judge and act right, by a veneration of the sense of others, than to be left to wander in pernicious errors, and continue deaf to all argument, and blind to all evidence. They are but children of a larger size; and since they persist all their lives in their minority, and reject all true reasoning, surely we may try to persuade them to practise what is for their own interest by such childish reasons as they will hearken to. We may overawe them from pursuing their own ruin by the terrors of a solemn shadow, or allure them by a sugar plum to their own happiness. But after all, we must conclude, that wheresoever it can be done, it is best to remove and root out those prejudices which obstruct the entrance of truth

into the mind, rather than to palliate, humour, or indulge them; and sometimes this must necessarily be done, before you can make a person part with some beloved error, and lead him into better sentiments.

On the whole, we would recommend more mutual forbearance and less acrimony than is commonly found among writers on disputed subjects, as the only means by which our differences in religion, politics, and science, ever can be healed, and truth certainly discovered. If men were less violent in defending their particular opinions, they would always gain a more patient hearing, they would be less suspected of, and less liable to, prejudice, and of course more apt either to convince, or to be convinced. They would likewise by so doing show, in the most unequivocal manner, their attention to sound philosophy, and above all to genuine Christianity; which, though it is far from encouraging scepticism, or a temporizing spirit, recommends, in the strongest terms, among all its professors, universal charity and mutual forbearance. See PROBABILITY, TRUTH, and SUPERSTITION.

TO PREJUDICE. *v. a.* (from the noun.) 1. To prepossess with unexamined opinions; to fill with prejudices (*Prior*). 2. To obstruct or injure by prejudices previously raised (*Whilgift*). 3. To injure; to hurt; to diminish; to impair; to be detrimental to (*Prior*).

PREJUDICIAL. *a.* (*prejudiciable*, Fr.) 1. Obstructed by means of opposite prepossessions (*Holyday*). 2. Contrary; opposite (*Hooker*). 3. Mischievous; hurtful; injurious; detrimental (*Atterbury*).

PREJUDICIALNESS. *s.* (from *prejudicial*.) The state of being prejudicial; mischievousness.

PRELACY. *s.* (from *prelate*.) 1. The dignity or post of a prelate or ecclesiastic of the highest order (*Ayliffe*). 2. Episcopacy; the order of bishops (*Dryden*). 3. Bishops. Collectively (*Hooker*).

PRELATE. *s.* (*prelat*, Fr. *prælatus*, Lat.) An ecclesiastic of the highest order and dignity (*Shakspeare*).

PRELATICAL. *a.* (from *prelate*.) Relating to prelates or prelacy.

PRELATION. *s.* (*prælatus*, Latin.) Preference; setting of one above the other.

PRELATURE. **PRELATURESHIP.** *s.* (*prælatúra*, Latin.) The state or dignity of a prelate.

PRELECTION. *s.* (*prælectio*, Latin.) Reading; lecture; discourse (*Hale*).

PRELIBATION. *s.* (from *prælibo*, Lat.) Taste beforehand; effusion previous to tasting (*More*).

PRELIMINARY. *a.* (*preliminaire*, Fr.) Previous; introductory; proemial (*Dryden*).

PRELIMINARY. *s.* Something previous; preparatory act (*Pope*).

PRELUDE, PRELUDIO, or PRELUDIUM. (From the Lat.) A short introductory composition, or extempore performance, to prepare the ear for the succeeding movements.

PRELUDE denotes, 2. something introductory; something that only shows what is to follow (*Addison*).

To PRELUDE *v. a.* (*preluder*, Fr. *préludo*, Lat.) To serve as an introduction; to be previous to (*Dryden*).

PRELUDIOUS *a.* (from *prelude*.) Previous; introductory (*Cleaveland*).

PRELUDIUM *s.* (Latin.) Prelude (*Dryden*).

PRELUSIVE *a.* (from *prelude*.) Previous; introductory; proemial (*Thomson*).

PREMATURE *a.* (*præmaturus*, Latin.) Ripe too soon; formed before the time; too early; too soon said, or done; too hasty (*Hammond*).

PREMATURELY *ad.* Too early; too soon; with too hasty ripeness.

PREMATURENESS. PREMATUREITY. *s.* (from *premature*.) Too great haste; unreasonable earliness.

To PREMEDITATE *v. a.* (*præmeditor*, Latin.) To contrive or form beforehand; to conceive beforehand (*Dryden*).

To PREMEDITATE *v. n.* To have formed in the mind by previous meditation; to think beforehand (*Hooker*).

PREMEDITATION *s.* (*premeditatio*, Latin.) Act of meditating beforehand (*More*).

To PREMIERIT *v. a.* (*præmereor*, Lat.) To deserve before (*King Charles*).

PREMICES *s.* (*primitiæ*, Latin; *premiées*, French.) First fruits (*Dryden*).

PREMIER *a.* (Fr.) First; chief (*Camden*).

To PREMISE *v. a.* (*præmissus*, Lat.) 1. To explain previously; to lay down premises (*Burnet*). 2. To send before the time: not used (*Shakspeare*).

PREMISES *s.* (*præmissa*, Lat.) 1. Propositions antecedently supposed or proved (*Hooker*). 2. In law language, houses or lands.

PREMISS *s.* (*præmissum*, Latin.) Antecedent proposition (*Watts*).

PREMIUM *s.* (*præmium*, Lat.) Something given to invite a loan or a bargain.

PREMIUM OF ASSURANCE, is the sum of money given to an insurer, or to a company, either annually, or at one or more distant payments, to secure a certain advantage or privilege.

PREMISLAU, a town of Poland, in the palatinate of Lemburg, with a strong castle, and a Greek and Latin bishop's see. It is seated on the river Sana, 60 miles W. by S. of Lemburg. Lon. 21. 0 E. Lat. 49. 0 N.

PREMNA, in botany, a genus of the class didynamia, order angiospermia. Calyx two-lobed; corol four-cleft; seeds solitary. Three species; trees of the East Indies.

To PREMONISH *v. a.* (*præmoneo*, Lat.) To warn or admonish beforehand.

PREMONISHMENT *s.* (from *premonish*.) Previous information (*Wolton*).

PREMONITION *s.* (from *premonish*.) Previous notice; previous intelligence (*Chapman*).

PREMONITORY *a.* (from *præ* and *mones*, Lat.) Previously advising.

To PREMONSTRATE *v. a.* (*præ* and *mones*, Latin.) To show beforehand.

PREMONTVAL (Peter le Guay de), was born at Charenton in 1716, and became a member of the academy at Berlin; at which place he died in 1767, at the age of 51. His best work is his *Preservatifs contre la corruption de la langue Française*, written in German.

PREMUNIRE. See **PRÆMUNIRE**.

PREMUNITION *s.* (from *præmunio*, Lat.) An anticipation of objection.

PRENANTHES. Wild lettuce. In botany, a genus of the class syngenesia, order polygamia equalis. Receptacle naked; calyx invested with scales; down simple, mostly sessile; florets in a single row. Thirty-three species, scattered over the globe; one, *P. muralis*, common to our own groves.

To PRENOMINATE *v. a.* (*præ* and *nominio*, Latin.) To forename (*Shakspeare*).

PRENOMINATION *s.* (*præ* and *nominio*, Latin.) The privilege of being named first (*Brown*).

PRENOTION *s.* (*prenotion*, French.) Foreknowledge; prescience (*Brown*).

PRENTICE *s.* (contracted from *apprentice*.) One bound to a master, in order to instruction in trade (*Shakspeare*).

PRENTICESHIP *s.* (from *prentice*.) The service of an apprentice (*Pope*).

PRONUNCIATION *s.* (*prænuncio*, Lat.) The act of telling before.

PREOCCUPANCY *s.* (from *preoccupate*.) The act of taking possession before another.

To PREOCCUPATE *v. a.* (*preoccupar*, Fr.) 1. To anticipate (*Bacon*). 2. To prepossess; to fill with prejudices (*Wolton*).

PREOCCUPATION *s.* (*preoccupation*, French.) 1. Anticipation. 2. Prepossession. 3. Anticipation of objection (*South*).

To PREOCCUPY *v. a.* To prepossess; to occupy by anticipation or prejudices (*Arbuthnot*).

To PREOMINATE *v. a.* (*præ* and *ominor*, Latin.) To prognosticate; to gather from omens any future event (*Brown*).

PREOPINION *s.* (*præ* and *opinio*, Lat.) Opinion antecedently formed; prepossession (*Brown*).

To PREORDAIN *v. a.* (*præ* and *ordain*.) To ordain beforehand (*Hammond*).

PREORDINANCE *s.* (*præ* and *ordinance*.) Antecedent decree: not in use (*Shakspeare*).

PREORDINATION *s.* (from *preordain*.) The act of preordaining.

PREPARATION *s.* (*præparatio*, Latin; *préparation*, French.) 1. The act of preparing or previously fitting any thing to any purpose (*Wake*). 2. Previous measures (*Burne*). 3. Ceremonious introduction (*Shakspeare*). 4. The act of making or fitting by a regular process (*Arbuthnot*). 5. Any thing made by pro-

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ness of operation (*Brown*). 6. Accomplishment; qualification: out of use (*Shakspeare*).

PREPARATION OF ANIMALS, and parts of animals: of vegetables and parts of vegetables, for the purpose of preserving them.

This is a very extensive and important subject. It is obviously extensive from its range; and it is of great importance, as it affords the best and most direct mode of conveying instruction, and of communicating a knowledge of natural facts, of which, in thousands of instances, we could never otherwise become eye-witnesses. We shall examine it, therefore, in the order in which we have now noticed it, and shall treat successively of the preservation, first of animal, and secondly of vegetable substances.

I. PREPARATION OF ANIMAL SUBSTANCES.

Of the two distinct branches, this is by far the most momentous; and it has been studied to a certain extent in all ages.

Animals are prepared in such manner that the exterior and entire form may be preserved; or only that particular parts of it, dissected from the rest, may be distinctly and permanently presented to the view. The former method comprises the art of embalming and of preparing animals for cabinets and museums of natural history: the latter comprehends the art of anatomical and zootomical preparations.

Embalming.—This appears first of all to have been practised in Egypt, where it constituted a branch of medical science, and was carried to so high a degree of perfection, that the bodies which were the subjects of it, and which, when duly prepared, were called mummies, have in many instances been preserved to the present day, and have consequently descended through a period of many thousand years. Upon this topic, however, we have already treated, under the word **EMBALMING**, and without encumbering our pages further, shall refer the reader to that article.

Preparation of animals for museums.—The art of chemistry, which is of high importance in the process of embalming, is of equal value in the assistance it affords the naturalist in the preparing quadrupeds, birds, fishes, and other animals, for his cabinet of curiosities. It points out the means not only of giving them duration and consistence, but of continuing to them as long as possible their general appearance in a living state, their natural attitudes, positions, and distinctive characters.

Reaumur will be found to have published a treatise upon this subject, in the *Philosophical Transactions*, vol. XLV. and there is another treatise that at one time was regarded as of considerable consequence in the *Dictionnaire d'Histoire Naturelle*; neither of which, however, are very satisfactory, or capable of leading us to much perfection in this delicate art. The hints thrown forth by Dr. Hunter, and to which we have adverted in the article **EMBALMING**, are of far more importance, and should be studied and put in practice in connection with the directions afforded by the principal writers upon this subject, among whom we may place Kuckham, Chaptal, and Pinel.

Kuckham published a process for the preparation of birds in the *Philosophical Transactions*, vol. LX. His composition to preserve them from putrefaction is a mixture composed of a quarter of a pound of corrosive sublimate; half a pound of

calced saltpetre; a quarter of a pound of calced alum; half a pound of flowers of sulphur; a quarter of a pound of musk; one pound of black pepper; and one pound of pulverised tobacco: these are to be kept mixed together in a well-closed glass vessel, and in a dry place. The corrosive sublimate is an useful ingredient in the preparation of various quadrupeds: but it is fatal to all except the coleopterous or crustaceous insects; and another objection to the entire compound is its expence. On this last account, Pinel recommends the following substitute: equal parts of corrosive sublimate, or arsenic, calced alum, camphor and canella, or any other aromatic: all which are in like manner to be pulverised and mixed together.

Pinel has also strongly recommended the following varnish, which was for a long period kept as a profound secret, and was well known to have been employed with great success, especially in preventing the generation of minute insects in the skins of dead animals, as well as in destroying them if hatched: so that for three or four years, till they can be conveniently placed in the collection for which they are designed, the keeping such preparations under glasses may be dispensed with, and they may be packed up without injury in close cases. It is composed of the following articles: Four ounces of pulverised arsenic are to be put into one pound of brandy, and the mixture is to be gently heated; a quantity of black soap and aloes are then to be added, so as to form a kind of magma, which must be lightly extended while warm in the interior of the animal with a brush, the soft parts having been removed, the same process being applied to the external surface of the skin. When used, however, he recommends it to be diluted with alcohol: and immediately after its use the preparation should be mounted, as the evaporation of the fluid part occasions the skin to become harsh and difficult to soften again.

It is with this magma that cotton or flax ought to be impregnated, with which the internal parts of animal bodies are to be filled; and it is found to be far superior to the mixture composed of a solution of camphor in rectified spirit of wine, which is the preparation commonly used in our own country. It is likewise necessary that the zoologist should be provided with caustic soda, a solution of which corrodes the soft parts, and by uniting with the fat parts forms a species of soap that is afterwards easily taken out by repeated lotions. Chaptal recommends the cranium and intestines, when deprived of their contents, to be syringed with sulphuric ether.

Small animals or parts of large ones are often preserved by being kept in spirit of wine; for which purpose it is remarked by Leonhardi that a little water and a fifth part of spirit of sal ammoniac should be added, which will continue the colour and the softness.

Anatomical preparations.

These consist of viscera in a healthy or a morbid state. We shall notice both in their order.

Preparations of the viscera in a healthy state.—The various parts of the body may be preserved in a healthy state, either to exhibit their form or structure, or to compare them with morbid parts.

When removed from the body, and the useless parts dissected away, the part to be preserved is

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to be soaked in water, in order to get out the blood.

When it is necessary to give parts their natural form, which is lost by macerating; put them into a saturated solution of alum, or rectified spirit, retaining them by any means in the required form until they become hardened. If it be a hollow part, as the stomach, bladder, &c. fill it with, and immerse it in, the solution, or spirit.

When an opening is to be exhibited, as that of the ureter, the bile-duct, the lacunæ of the urethra, Stenonian duct, Fallopian tube, &c. introduce a bristle. After this manner preserve the uterus and its appendages, cutting open the vagina and cavity of the uterus, the bladder, intestine, stomach, heart in the pericardium, liver, spleen, kidney, &c. &c.

All preparations of the brain are best hardened in a saturated solution of corrosive sublimate.

The parts are to be suspended in proof spirit by raw silk, in a tie-over bottle, and covered with putrid bladder, taking care to exclude all air. When dry, varnish the bladder with mucilage of gum arabic several times; then put a sheet of thin lead over, and varnish its edges with mucilage; and, lastly, tie another bladder over, and give it a coat of common spirit varnish, in which lamp-black, or other colouring matter, is mixed, or with Brunswick varnish.

Preparations of morbid parts.—All morbid parts should, immediately after their removal from the body, be put into rectified spirit of wine for a day or two, and then preserved in proof spirit. These preparations foul a great quantity of spirit, and should therefore be kept in stopper-glasses, from which the spirit can easily be removed, and fresh put in, until the preparation ceases to foul the spirit, when it may be put into a tie-over bottle.

Preparations made by macerating.—Preparations obtained by this process are very various.

Let the water be frequently changed, until it is no longer coloured with blood, but never after the blood is steeped away. Let the macerating pan be placed in a warm place, to facilitate putrefaction, for if it be put in a cold place, the spermatic-like conversion of the soft parts will be formed, and the part spoiled. The soft parts surrounding bones are a long time before they detach themselves from the bones. Bones, when macerated, should be exposed to the sun's rays, and frequently wetted with clean water, or they may be bleached with the diluted oxygenated muriatic acid.

Bones are macerated, to be preserved whole; or they are sawed, to expose their internal structure. In preparing the bones of the head, put the whole head, without disturbing the flesh or brains, into the pan. When sufficiently macerated, all the soft parts will come away with the periosteum; then detach the vertebrae, and wash out the brain. Bones are separated from each other by filling the cranium with peas, and putting it into water. The same method is to be adopted with other bones.

In preparing bones in general for structure, divide the femur into two halves: the os innominatum, the petrous portion of the temporal bone, the parietal bone, &c.: these, when macerated, will exhibit the compact, the spongy, laminated, and reticular substance of bones.

Fœtus.—Cut carefully away the fatty substance

enveloping a fœtus, but do not cut any of the cartilages. Steep out its blood, and macerate. It should be frequently looked at, and taken out when the flesh is all destroyed, before the cartilages are separated. The following preparations are obtained in this way:

The superior extremity, to shew its bones, the progress of ossification, and the cartilage to be formed into bone. The lower extremity, to expose the same circumstance. The spine, which forms a beautiful preparation. The pelvis, not less elegant. The mode of preservation is by proof spirit.

The cuticle of the hand and foot may be separated by maceration: the former is called chirotheca, the latter podatheca. The arm and foot of a large fœtus are to be preferred; they are first to be well washed with a soft sponge in soap and water.

Preservation.—Suspend them in proof spirit: first tie the part by which they are to be suspended, then put them into the bottle with the spirit, and gently pour some spirit into the cuticle, to distend it like a glove or stocking.

Injecting instruments.—The celebrated Dutch anatomist, Ruysch, first invented the art of injecting animal bodies; hence it is termed the Ruyschian art.

There are three kinds of apparatus used in making injected preparations. The one for the coarse and fine injections, and the minute injection; the other for injecting with quicksilver; and the third, called the oyster syringe, for injecting minute preparations with the minute injection only.

The first consists of a brass syringe made for the purpose, of various sizes, from one carrying six ounces to one sufficiently large to hold two pounds. The point of these syringes is adapted to the pipes into which it is to be affixed. To this syringe belong a stop-cock, and a great variety of pipes.

The instrument for injecting quicksilver consists of a long glass tube, at whose end is fixed, by screwing in, a steel pipe, the end of which is extremely fine.

The oyster syringe is similar to the large syringe, except in size. It is so small, that when the syringe is in the hand, and full, its piston may be commanded by the thumb of that hand to throw its contents into any preparation in the other hand. The pipe affixed by being screwed to the end of this syringe is nearly as small as that belonging to the quicksilver tube.

These instruments are always to be had at the surgical instrument-makers.

The injections employed for anatomical purposes are of four different kinds: coarse, fine, minute, and mercurial.

Coarse injections.—Red.—Yellow bees' wax, sixteen ounces—the palest resin, eight ounces—turpentine varnish, six ounces, by measure—finely levigated vermilion, three ounces.

Yellow.—Yellow bees' wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—king's yellow, two ounces and a half.

White.—Fine virgin wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—best flake white, five ounces and a half.

Pale blue.—Fine virgin wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—best flake white, three ounces and a half—fine blue smalt, three ounces and a half.

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Dark blue.—Fine virgin wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—blue verditer, ten ounces and a half.

Black.—Yellow bees' wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—pure lamp-black, one ounce.

Green.—Yellow bees' wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—levigated crystallized verdigrise, four ounces and a half—best flake white, one ounce—levigated gamboge, one ounce.

Liquefy the wax, resin, and turpentine varnish over a slow fire, in an earthen pipkin; then add the colouring matter, having previously mixed it in another pipkin, with a very small quantity of the melted composition. Stir the whole well together with a wooden pestle, so that the colouring ingredients may be intimately and smoothly blended; place the whole again over the fire, and, when they have acquired their due heat, the injection will be fit for use.

Fine injections.—Brown spirit varnish, white spirit varnish, of each four ounces—turpentine varnish, one ounce.

These are to be put together in an earthen pipkin, over a slow fire, until they have acquired the necessary degree of heat. To make it of a red colour, put one ounce of finely levigated vermilion into another pipkin, and gradually add the heated materials, stirring the whole with a wooden pestle, that the colour may be equally diffused.

One ounce and a quarter of king's yellow—two ounces of best flake white—one ounce and a half of fine blue smalt, with one ounce and a quarter of best flake white—four ounces of blue verditer—half an ounce of pure lamp-black—are the proportions for the various colours to the quantity of ingredients ordered above.

Minute injections.—The size, which forms the vehicle to the colouring matter in these injections, is made in the following manner:

Take, of the finest and most transparent glue, one pound, break it into small pieces, put it into an earthen pot, and pour on it three pints of cold water; let it stand twenty-four hours, stirring it now and then with a stick; then set it over a slow fire for half an hour, or until all the pieces are perfectly dissolved; skim off the froth from the surface, and strain it through a flannel for use.

Isinglass and the cuttings of parchment make an elegant size for very particular injections; and those who are not very nice may use the best double size of the shops.

Red.—Size, one pint—Chinese vermilion, two ounces.

Yellow.—Size, one pint—king's yellow, two ounces and a half.

White.—Size, one pint—best flake white, three ounces and a half.

Blue.—Size, one pint—fine blue smalt, six ounces.

Green.—Size, one pint—levigated crystallized verdigrise, two ounces—best flake white, levigated gamboge, of each eight scruples.

Black.—Size, one pint—lamp-black, one ounce.

All injections are to be heated to such a degree as not to destroy the texture of the vessels they are intended to fill: the best criterion of this degree of heat is dipping the finger into the injection. If the finger can bear the heat, the texture of the vessels will not be hurt.

All the coloured materials should be as finely levigated as possible, before they are mixed with the injection.

Great care should be taken lest the oily ones boil over, or bubble; and that the heat be gentle, otherwise the colour will be altered. They should be constantly stirred, lest the colouring material, which is much heavier than the vehicle, fall to the bottom. The instrument to stir them with should be a wooden pestle, and there should be one for each colour. A large tin pan to contain water, with two or three lesser ones fixed in it for the injections, will be found very useful, and prevent all accidents, and the colour from spoiling when on the fire.

Preparations made with coarse injection.—The blood-vessels are mostly filled with coarse injection, and the parts dissected, to shew their course; and when the anatomist wishes to exhibit the minuter branches, the fine injection is to be thrown in first, and followed by the coarse.

There are several circumstances to be observed in injecting with the fine and coarse injections, which are applicable to every part into which they are thrown; these are—the part to be injected should be freed from its blood as much as possible, by steeping it for several hours in warm water, and repeatedly changing it. Having emptied the part of its blood, the pipes are to be fixed in their proper vessels, and all other vessels to be tied with a ligature. The heat of the water is then to be gradually increased to the same temperature with the injection to be thrown in. The injecting syringes should be steeped in the water with the part to be injected until wanted. The injection being finished, and the subject cold, remove the pipes and tie up the parts they were in. Whenever a vessel is open, by accident or otherwise, be sure to secure it by a ligature, or cover it with a piece of thin and moist bladder, or the injection will always be oozing out. The parts dissected and dried are to be varnished twice with copal or hard varnish, first washing them free from grease with some soap-lees, and well drying them again.

Blood-vessel subject.—Select an emaciated subject, between the age of two and fourteen years.

Make an incision through the integuments the whole length of the sternum: then, with a saw, divide the sternum longitudinally into two equal parts; introduce a dissecting knife under the divided bone on each side, separate it from the mediastinum, and lay open the thorax, by bending back the two portions of the sternum and the cartilages of the ribs: an incision is then to be made into the pericardium, and the left ventricle of the heart, and a large pipe introduced into the aorta, and secured by a ligature. The subject is next to be put into warm water, and gradually heated. The time generally required to heat the whole subject is four hours, in a large body of water.

If the veins are to be injected, three more pipes are required: one to be put into the angular vein, at the corner of the orbit; another into a vein as near the fingers as possible; and the third into a vein as near to the toes as possible.

The subject and injection being properly heated, throw the coarse red injection into the heart pipe, which will fill the arterial system; and then the coarse yellow injection into the head pipe first, and next into the pipes of the extremities. The subject, when injected, should be put into cold water, with its face downwards.

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Open the abdomen by an incision from the sternum to the umbilicus, and thence to each ilium. Cut away the abdominal viscera, the stomach, spleen, and intestines; leaving the mesenteric vessels as long as possible: dissect away the liver, leaving the vena portæ and hepatic artery as long as possible. This done, dissect away the fat and cellular membrane from the vessels; secure the mesenteric vessels in an arborescent form on a piece of pasteboard. The kidneys, urinary bladder, uterus, and its appendages, are to be preserved and dried in their situations. From the thorax are to be removed the lungs and heart, or the latter may remain. The integuments being carefully dissected from the sternum, it is to be bent back, and kept in that situation, to expose the internal mammary arteries. The dissecting away the skin is next, in order to exhibit the muscles, and expose the arteries and veins. The skin should only be removed from time to time to carry on the dissection, and never more than that covering the part to be dissected; otherwise the parts from which the skin is removed will become dry, and the dissection be spoiled. In dissecting the arteries and veins, the dissector will find no difficulty, if he proceeds cautiously from the larger trunks towards their extremities. The brain is to be removed by sawing away a large portion of the bone on each side of the longitudinal sinus of the dura mater. The cheeks should be pushed out by introducing horse-hair into the mouth.

When dissected, or before, the subject should be hung up by the head in a frame: one arm is to be placed at a little distance from the side, and the other turned up over the head, with the palm of the hand in front: the legs at a little distance from each other, and kept in these postures by pack-thread. Should any muscles obstruct the sight of the arteries, they are to be separated to a proper distance by pieces of wood. This done, expose it to a current of air, in a place where it cannot get wet; and if the weather be moist, remove, from time to time, all moisture, by a soft sponge.

Varnish it several times, and keep it in a dry place, and in a proper case, with a glass front and back.

A head for arteries and veins.—Choose an emaciated head of an adult, separated from the body, by a transverse section, about the sixth or seventh vertebra.

Put a pipe into each carotid, or, what is better, one pipe with a bifurcation: remove a portion of bone over the longitudinal sinus of the dura mater, about the middle of the parietal bones, and secure a pipe in the longitudinal sinus, pointed towards the occiput. Put the head into warm water, to soak, pressing the blood occasionally out of the external and internal jugulars. Then tie up the jugular veins and vertebral arteries, and all the small vessels.

Into the carotids throw the red injection, and the yellow, or dark blue, into the pipe in the sinus of the dura mater. The former will fill the arteries, the latter the veins.

Follow the course of the larger trunks, dissect out the globes of the eyes, and remove with a fine saw the portion of the jaw-bone behind the last molaris, to shew the course of the internal carotids. To prepare the whole head, a portion of the cranium must be removed, by sawing on one side of the longitudinal sinus of the dura mater, from the frontal sinus to the horizontal spine of the occipital bone, and then sawing horizontally above the ear, from one extremity of the former incision to the other.

The dura mater should be removed with a pair of scissors, the brain carefully washed out, and the tentorium and falx preserved. It is better to make a perpendicular section of the head, a little to one side of the sagittal suture, through the nose, foramen magnum, and vertebra; and thus prepare each side. The course of the cervical artery is to be shewn by dissecting away the muscles, &c. from between the transverse processes.

Varnish it several times, and keep it in a glass-case, suspended; or fix it by the neck, and cover it with a glass bell.

An arm, for arteries and veins.—Remove the superior extremity from the trunk, by separating the clavicle from the sternum, raising it, and passing the knife under it to the articulation, including the greater part of the pectoral muscle. Then cut under the scapula, so as to remove with the arm the clavicle, scapula, and subscapularis muscle.

After soaking it in warm water, force out the blood from the veins, by pressing the extremity from the fingers towards the shoulder. Fix a pipe in the axillary artery, and another in the largest vein on the back of the hand; some warm water may be injected into the vein, so as to wash out the blood; and, when pressed out, the axillary vein should be tied. Tie any muscular branches that may be gaping.

Red injection may be thrown into the artery, and yellow, or dark blue, into the vein.

This is very simple; it requires only the removal of all the cellular and fatty membrane, and exposing the course of the vessels. Tie up the limb by the clavicle.

When varnished, keep it in a cool and dry place.

A lower extremity, for arteries and veins.—Having removed the contents of the abdomen, make a section through the symphysis of the pubis, and the ligaments connecting the ilium and sacrum, so as to remove one side of the pelvis.

Fix a pipe in a vein as near the toes as possible, and another in the iliac artery. When the limb has been well soaked in warm water, press out the blood from the veins, or throw in some warm water at the venal pipe; but carefully press it out again, and tie up the iliac vein. Secure all divided vessels.

Blue injection, or yellow, may be put into the vein, and red into the artery.

Expose the course of the artery and veins, particularly the profunda of the thigh.

The gravid uterus, for arteries and veins.—The gravid uterus, or the uterus soon after it has expelled the fœtus, may be injected, to shew its large and tortuous vessels. It may be injected whilst in the body; but this is always attended with much difficulty, and never succeeds so well as when removed from the body. Therefore separate the spermatic and hypogastric vessels as far from the uterus as possible, and cut out the uterus with the bladder, vagina, and external parts of generation.

Put a pipe in each spermatic artery, and each hypogastric, and also one into each spermatic and hypogastric vein; so that, at least, there will be four pipes for arteries, and four for veins, necessary. Be very careful that all the divided vessels be secured by ligature, which only can ensure success.

Red and yellow are mostly preferred; the former for the arteries, the latter for the veins. Be careful that the red be thrown into all the arterial pipes, and the yellow into the venal; and, to prevent mistakes, it will be better to have the pipes of the veins different from those of the arteries.

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Distend the vagina and uterus with horse-hair, either by introducing it through the vagina, or, if the fœtus be in it, by a perpendicular section through the anterior parietes, which is to be sewed up again. Then dissect away all loose cellular structure and fat, preserving the round and broad ligaments, and Fallopian tubes. Should the fœtus be in the uterus, an incision should be made, as above directed, except the placenta be adhering there, which is known by the great number of vessels, and then on the opposite side, and through the membranes, to remove the child; cut the umbilical cord close to the fœtus, and fix a pipe in one umbilical artery, and another in the umbilical vein; the latter carrying arterial blood, should be filled with red injection, and the artery with yellow: the cord is to be laid round the placenta.

When well varnished, suspend it in a case, with a glass front and back.

A placenta, for arteries and veins.—This is perhaps the easiest preparation to make with coarse injection; and should, therefore, be the first attempt of the student.

Fix a large pipe in the vein, and a small one in one of the arteries. The difficulty usually attendant on getting the pipe into the artery is obviated in a great measure by introducing the point of the scissors into these vessels, and slitting them down for about half an inch, then spreading the artery open upon the fore-finger, and keeping it so by pressure with the thumb, by which the pipe may be carried in without difficulty. A ligature should be passed round each pipe with a needle, taking care not to puncture any of the vessels.

The usual colours are to be selected; but instead of throwing the yellow into the vein, it should be pushed into the artery, for the artery here performs the functions of a vein, and *vice versa*. When there are two placenta there should be different colours used.

The spongy substance is to be carefully dissected away from the injected vessels, the placenta soaked in cold water, to get rid of its blood, and then dried, curling the cord around it; and should the membranes not be much torn, they may be distended with curled hair over it.

Varnish it well; fix its bottom in a case with a glass top.

The heart, in situ, with the head, and adjacent vessels.—For this purpose choose the head of a young subject, or an adult, whose heart is free from fat. The liver, stomach, spleen, &c. are to be removed from the abdomen, and the aorta divided just as it gives off the cœliac artery. The incision into the chest should be carried through the integuments, from the trachea to the ensiform cartilage, the sternum sawed through, and bent one half on each side, from the extremity of the cartilages nearest the ribs; then divide one of the pulmonary veins as near as possible to the lungs, and remove a portion of bone over the longitudinal sinus of the dura mater.

Having well soaked the parts in warm water, and squeezed the blood from the heart and vessels, by the inferior cava and pulmonary vein, put a pipe into the longitudinal sinus of the dura mater, pointed towards the occipital bone, another into the pulmonary vein, a third into the vena azygos, and one into the receptaculum chyli, or thoracic duct. Tie up carefully the aorta and the vena cava inferior, and put a strong ligature around the middle of each arm.

Three colours are required:—one for the arteries, which should be red; another for the veins,

which may be yellow or blue; and the third for the thoracic duct, which should be white, to imitate chyle. Throw the red injection into the pipe in the pulmonary vein, which will fill the left auricle, ventricle, aorta, and all the arteries. The pipe in the head is for the yellow injection: by this will be filled the veins of the head, face, neck, and chest, the right auricle of the heart, the right ventricle, and the pulmonary arteries. Should the vena azygos not be injected, the yellow injection is to be thrown into it. A small quantity of white injection is sufficient for the thoracic duct.

Remove the body by a transverse section at the last dorsal vertebra, then amputate the arms at their middle, saw away one side of the bones of the skull, and wash away the brain: then dissect away all the loose cellular membrane and fat, and expose the various parts in the best manner; dissect away the lungs, leaving the pulmonary arteries as long as possible.

This is, when well done, a valuable preparation, and deserving of great care. Varnish it well, and preserve it in a square glass-case.

A fœtus, to exhibit the peculiarities of its circulation.—For this purpose select a still-born fœtus; and, if possible, one that died from a flooding of the mother.

Dissect the umbilical vein from the arteries, about four inches from the umbilicus, and fix a pipe in it, taking care not to include the arteries. Throw warm water into this pipe, and wash out the blood, which will flow out by the umbilical arteries. Having drained away as much of the water as possible, tie a ligature very loose on the umbilical arteries.

The fœtus being heated, throw in gently any coloured injection. The water will come away first through the umbilical arteries; and, when the injection appears, make the ligature firm, to prevent its further egress.

The peculiarities in the fœtal circulation are the umbilical cord, the ductus venosus, the ductus arteriosus, and foramen ovale. When the body is cold, proceed to the dissection; remove the head from the cervical vertebrae, the arms, with the scapulæ, and pectoral muscles; the inferior extremity at the articulation with the pelvis, the whole of the parietes of the abdomen, leaving the arteries running to the cord by the sides of the bladder; the anterior part of the thorax, with the sternum, cartilages, and part of the ribs, the integuments and muscles of the back. Next cut away the lungs, and remove the pericardium; keep the diaphragm in its place, and turn up the liver, so as to expose the ductus venosus. Some discretion and care is here necessary. Dissect away the stomach and intestines, and lay out the mesenteric vessels, distend the bladder with air, and cut away any thing that may obstruct the view of the vessels. The foramen ovale cannot be exhibited.

After having varnished it, hang it in a glass bell, with a hook at its top.

The penis may be injected, to shew the two corpora cavernosa, the corpus spongiosum, and glans, with the arteries and veins. For this purpose any healthy penis will do, but large ones are generally preferred. Having cut through the integuments and soft parts in the pelvis, in the direction the saw is to be passed, saw through the middle of each crista of the pubis, straight down and through the ascending ramus of each ischium, close to their commencement, and thus remove the pubis, with the bladder and external parts of generation.

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Make an incision into either of the crura of the corpora cavernosa, and into the bulbous part of the urethra, as near to the prostate gland as possible; soak it in hot water, and carefully press out the blood from every part. Introduce a probe along the vena magna ipsius penis, by an incision at its root, to break down its valves; fix a pipe in each of these incisions, and another in each vas deferens, at its entrance into the vesiculæ seminales, and secure all the divided vessels.

Four colours are necessary; those generally preferred are red, yellow, blue, and white. Throw the red into the corpus spongiosum, which will distend the glans; the yellow into the corpus cavernosum pipe; the blue into the vena magna ipsius penis; and the white into the vasa deferentia.

Inflate the bladder, dissect away all the soft parts, and keep the penis erect against the symphysis pubis. Preserve it in a covered box.

A testicle of an adult should be chosen free from disease, and great care is requisite in removing it from the body. First, enlarge the ring of the oblique muscle, push the testicle through from the scrotum, and separate its cellular connecting substance; then cut the spermatic artery and pampiniform plexus as high as possible, and then the vas deferens.

When well soaked, press out the blood from the veins; put a pipe into the spermatic artery, and another into a vein; and secure all other open mouths.

Red is to be sent into the artery, and yellow or blue into the vein, which is without valves. Then fix the quicksilver tube in the vas deferens, and suspend it in water; this done, fill it with mercury, and in twenty-four hours it may be removed to be dissected.

Cut away the tunica vaginalis and the tunica albuginea, which requires great care: then remove all the cellular and adipose membrane, and dry it on a board previously waxed. Preserve it in a common preparation glass, on a blue or green paper ground.

The system of the vena portæ.—Remove the liver, spleen, stomach, and intestines all together, of a person whose mesentery is free from fat, cutting away at the root of the mesentery, behind the peritoneum.

Cut into a mesenteric vein, as near to the intestine as possible, and secure it with a ligature passed around it with a needle, taking care not to wound any other vein. Inject warm water, and let it again run out by the divided vessels. Drain its water off, and secure all the veins, the hæmorrhoidal especially.

Throw any colour into the pipe, which will pass into the splenic, mesenteric, and internal hæmorrhoidal vein, and into the vena portæ.

Remove all the soft parts; the stomach, spleen, and intestines; cutting the vessels as long as possible, and dry them in the best manner, either attached to the liver, or dissect away the liver from the vena portæ, taking care to preserve some of its ramifications. Preserve the preparation in a covered box.

The heart is mostly injected out of the body, to shew its common and proper vessels. For this purpose, choose a lean heart. Cut through the thoracic viscera immediately at the top of the thorax; divide the intercostal arteries by drawing the knife down the pleura, over the ribs beyond their origin; separate the vena cava inferior and aorta, in the abdomen, with the cavæ hepaticæ;

and remove the thoracic viscera, with the portion of the diaphragm surrounding the vessels.

Soak the blood and coagula out of the cavities of the heart, and press the blood from the coronaries. Put a pipe into the vena cava superior, and another into one of the pulmonary veins. Then tie the lungs at their root, the vena cava inferior, the arteria innominata, the left carotid and subclavian; and pass a ligature, with a slip knot, round the sinus of the aorta, and secure all other open vessels.

The common coloured injections, red and yellow, only are wanted. Throw the former into the pulmonary vein, which will fill the left auricle, ventricle, aorta, and coronary arteries. The yellow, being sent into the superior cava, will distend the right auricle, coronary veins, right ventricle, and pulmonary artery. In order to fill the coronaries well, the injector must stop two or three times in the course of the process, to squeeze on the injection in them with his nail; then heat the whole again, and throw in more injection. The preparation having cooled, a pipe is to be fixed at the bottom of the aorta, and some red injection, just hot enough to run through the syringe, is to be pushed along the aorta, an assistant throwing cold water on the intercostals, if the injection runs through them.

Cut away the lungs, pericardium, and all the soft parts. Preserve it either in a covered box, or under a glass bell.

Stomach. Intestines. Bladder.—These are best injected with the whole subject, but may be removed and injected separately.

The anatomist can only succeed by having the preparation constantly heated as he is throwing in the injection.

The injection should be thrown in very gradually.

When injected, the part should be immediately immersed in cold water.

Preparations with minute injection.—The vascularity of bones is to be demonstrated, by throwing fine injection into an extremity, cutting out the bone when cold, separating it from all the soft parts, immersing it in water for a few days, to soak out the blood, and then putting it into a mixture of muriatic acid and water in the proportion of one ounce to a quart, for three or four months, adding about, every month, a drachm of acid. The limb of a rickety child is to be chosen.

Put a pipe into the largest artery of the extremity, and throw gradually the red injection into it, fixing the stop-cock in the pipe.

Still-born children, when injected with minute injection, afford a number of beautiful preparations.

No water should be thrown into the vessels. Fix a pipe with a stop-cock into the umbilical vein, and tie the arteries in the ligature.

Red injection is always chosen for this purpose; and throw it in with great care, until the abdomen and skin all over become very tumid. First mucus comes from the nose and mouth, then the meconium from the anus, and often pure size.

Cut off the head from the shoulders, the arms below the shoulder joint, and the legs just below the acetabulum; then preserve a small quantity of the integuments around the navel, and remove all the anterior parietes of the abdomen and chest, so as to exhibit the thoracic and abdominal viscera. Cut away the integuments and posterior part of the theca vertebralis, to exhibit the medulla spinalis.

PREPARATION.

Soak out the blood, and preserve it in proof spirit, to shew the viscera and their vascularity.

From a well-injected fœtus may be obtained the following preparations:

If the fœtus be about seven months old, the membrana pupillaris.

If it be male of this age, the testicle in the abdomen, with the gubernaculum.

The vascular and radiated fibres of the parietal bones.

The vascular membrane, including the teeth.

The viscera of the chest separate, if better injected than those of the abdomen, shewing the vascularity of the lungs, thymus gland, and heart.

The stomach, which is to be inverted, to shew its vascular villous coat.

The intestines, which are to be separated from the mesentery, and inverted, to shew their villous coat.

The glandulæ renales and kidneys together, to exhibit their relative size, and the lobulated structure of the kidney.

The uterus and its appendages, to shew the long ovaria and plicæ of the neck of the uterus and vagina.

The external parts of the female organs of generation, to shew the hymen.

A red portion of the skin, to exhibit its vascularity.

The medulla spinalis, to shew its vessels, and the cauda equina.

The membrana tympani, to exhibit its vascularity.

The cavity of the tympanum, to shew its vascularity, and that of the periosteum of its bones.

The vestibulum and cochlea, to shew the membranous semicircular canals of the former, with their ampullæ injected, and the vascularity of the zona mollis.

The head, to shew the natural appearance of the face, the papillæ of the lips, tongue, &c.

The hand, to shew its natural colour.

The above preparations are all to be well soaked from their blood, and preserved in proof spirit of wine.

A portion of skin, freed of its adeps, to shew its vascularity.

The membrana tympani, to shew its vessels.

The heart, to shew the foramen ovale, by distending the cavities with air; and, when dry, cutting away the outermost sides of the auricles, and introducing a bristle.

Any large muscle, freed from its cellular membrane and fat, and dried, to shew the vascularity of the muscle.

These are all to be dried, well varnished, and preserved in bottles. Some prefer putting them into spirit of turpentine; but this should be avoided as much as possible, for the turpentine is always oozing in warm weather, and dirtying the glass.

The object of injecting a uterus with fine injection is to exhibit the vascularity of its internal membrane, which furnishes the catamenia. For this purpose the uterus of a person whose menstruation has not been stopped by age or disease is to be selected.

Remove the uterus, by dividing the vessels as long as possible, the round and broad ligaments, and as much as possible of the vagina. Tie a pipe in each hypogastric artery, and secure all the divided vessels.

Any coloured injection may be chosen, but red looks best.

Cut away all the loose cellular membrane, bladder, and rectum, if there be any, from around the vagina, and cut it open along the middle of its superior part; continue this incision on each side of the anterior part of the uterus, so as to exhibit the posterior surface of its cavity.

If the injection be successful, which it seldom is more than one time in ten, suspend it by the ligaments, and preserve it in proof spirit.

An adult head.—Separate the head as low as the last cervical vertebra from the shoulders.

Put a bifurcated pipe into the carotids. Secure the vertebral arteries and jugular veins, and all the divided parts. The red injection is always preferred.

From an adult head injected in this way may be made the following preparations:

The upper eyelid, to shew the vascularity of Meibomius's glands. The choroid membrane, exhibiting its vascularity. The retina, suspended by the optic nerve, exhibiting its vascularity. A section of the optic nerve, to exhibit the central artery. The whole of the cerebrum, cerebellum, and medulla oblongata, with the pia mater; or, the pia mater, separated from the convolutions of the brain, to exhibit the intergyral processes and the tomentum cerebri. One half of the nostrils, to exhibit the vascularity of Schneider's membrane, and that of the membrane lining the antrum of Highmore. The tongue, lying in the jaw, and suspended by the palatum molle, with the posterior fauces cut away, to shew the epiglottis and glottis, the uvula and velum pendulum palati, the tongue, its papillæ and excretory ducts, and the vascularity of the gums and sublingual glands.

The above preparations are to be soaked well in cold water, to get out all the blood, and then preserved in proof spirit.

Preparations with quicksilver.—Mercury cannot be coloured by any substances; it must, therefore, always present the same silver colour.

The parts should always be injected in a proper tray, that the mercury may be easily collected. A lancet, with a curved needle ready threaded, should be always at hand; and likewise, a bottle, whose neck is not so wide as to permit the quicksilver tube going to the bottom, when put into it. When injecting, if any circumstance render it necessary for the injector to put aside the tube with the mercury, it should be placed in the bottle, the mercury remaining in it, to be handy and prevent delay. Injecting with mercury is always tedious, and frequently unsuccessful. The parts exposed must be kept moist, by sprinkling them with cold water.

To inject the lymphatics of an arm, choose one from a dropsical subject, without fat; make an incision into the skin around the wrist, and seek diligently with a magnifying-glass, for an absorbent, into which the pipe is to be put, when the quicksilver will immediately run. The shoulder should now be placed considerably lower than the hand; and, when the mercury runs out at the divided vessels in the axilla, tie them up, and also the lymphatic, into which the pipe was introduced. Then seek for another absorbent. When the mercury ceases to run in a lymphatic, tie the vessel, and seek for another.

Begin at the lymphatics, where the mercury entered, and trace them; removing every thing that obstructs their view, but preserve the glands.

An inferior extremity for this purpose should also be taken from a dropsical person, and the

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same method adopted as with the superior extremity, seeking as near to the toes as possible for the lymphatics.

A parotid gland.—Cut down upon the masseter muscle, and seek for the Stenonian duct, which is the excretory duct of the parotid. Tie the quicksilver pipe in it, then fix the tube, and pour into it the quicksilver; and, when it ceases to run, remove the tube and pipe, and tie the duct. Be particularly careful, in dissecting away the gland, not to cut it.

Dry it on a waxed board, and preserve it on a blue paper and pasteboard, in spirit of turpentine.

The lymphatics running on the peritoneal coat of the liver, and over the gall-bladder, make a beautiful preparation. The liver should be well soaked for several days, and the pipe put into the lymphatics of the suspensory and coronary ligaments, and the mercury forced along them, breaking down the valves with the nail, by pressing on the mercury. Secure the vessels at the portæ of the liver, when the mercury gets there, and tie the lymphatics when filled. Should the anatomist's attempt to force the quicksilver beyond the valves be unsuccessful, he must fix upon the most minute obvious branch, and let it run its proper course.

Throw some coarse injection into the cavæ hepaticæ and vena portæ, without heating the liver thoroughly; inflate the gall-bladder, and dry the whole. Varnish it, and preserve it in the best manner under a glass bell, or preserve the injected part in proof spirit, without any wax injection.

The superficial lymphatics of the lungs are to be filled from the part most remote from the root of the lungs.

Cut away the part on which the lymphatics are filled. Dry it on a waxed board, varnish it, and preserve it in a bottle, on a green or blue piece of paper; or preserve it in proof spirit, without drying it.

Hand.—Select the hand of an aged female (separated from the arm by a transverse section, three inches above the wrist) that has died of a lingering disease. Soak out the blood in warm water; fix the pipe in the radial artery, then add the tube, and pour into it the mercury. As the mercury appears in the other arteries and veins, take them up and secure them with ligatures. Should the mercury still escape from small branches, put a cord round the arm, and with a piece of wood tighten it, by twisting the wood, taking care not to prevent the mercury passing into the hand. Then suspend the hand in a glass filled with water, and suspend also the tube and quicksilver in the manner represented in the annexed plate, for a day or two, that the mercury may get into the small vessels. When injected, remove the pipe, and tie, by a strong string, the fore-arm; put the hand into water, until putrefaction separates the cuticle.

Dry it carefully, and varnish it; then fix the fore-arm in a pedestal of plaster of Paris, and keep this beautiful preparation under a glass bell.

Lacteals.—Remove the mesentery and intestines, if the former be perfectly free from fat, and let them remain several days in water, which should be frequently changed. Search for an absorbent, on the intestine, into which introduce the quicksilver, which will run on to the glands in the mesentery, where it will stop. When the lacteals are filled, the preparation will be more elegant if

red and yellow coarse injection be thrown into the mesenteric arteries and veins.

Spread the mesentery on a waxed board, inflate a portion of the intestine, clear away all that is useless; dry and varnish, and preserve it in a glass frame.

Corroded preparations.—These preparations are made by filling the vessels with coarse injection, and corroding the soft parts, so as to exhibit those vessels.

The liquor for corrosion is to consist of three parts of muriatic acid, and one of water. The liquor should be kept in a well-glazed earthen vessel, with a top to it, also well glazed. The part to be corroded should be carefully moved in and out of this liquor, as the slightest force may break the vessels. When corroded, the pulpy flesh is to be carefully washed away, by placing it under a cock of water, the water flowing very slowly; or, in some instances, by squirting it away. When the preparation is freed of its flesh, it should be fixed in the situation it is to remain in, either in a plaster of Paris pedestal, or on a flat surface. If the flesh be not perfectly destroyed, the preparation is to be returned to the corroding liquor for a fortnight or month longer, or until it becomes pulpy.

Heart and lungs.—These viscera, occupying less space in children than adults, are to be preferred. It is of no consequence whether they are fat or lean. The integuments should be cut from the fore part of the neck; and the trachea, jugular veins, and carotid arteries removed, and, with them, the viscera of the thorax, carefully separating the subclavian vessels from the clavicle, without injuring them, and dividing the axillary vessels and the cava inferior and aorta, just below the diaphragm.

Soak the whole well, to free it of its blood, and press out all the fluids: fix a pipe in the inferior cava, and another in one of the pulmonary veins, taking care not to injure the others, by tying it. Then secure the carotids, the jugulars, the axillary vessels, the vertebral artery, the intercostals, the aorta, after it has formed its arch, the internal mammaries, and every vessel that can be found.

Red and yellow are generally preferred, but red and blue are more proper, and more elegant. Throw the blue into the vena cava inferior, which will distend the right auricle, the superior cava, the jugular veins, and great coronary vein, the right ventricle, and pulmonary arteries. The red injection will fill the left auricle and pulmonary veins, the aorta, subclavians, carotids, &c.

Great care is requisite in freeing the injection from the pulpy flesh. When done, let the apex of the heart be placed immediately in a plaster of Paris pedestal, and cover it with a glass. If the pulmonary vessels are well preserved, it forms a valuable preparation. If one good preparation be obtained in ten trials, it will amply repay the anatomist.

Heart.—A fat heart will do for this purpose. Inject it as directed in the article *heart, in situ*, three pages back, and put it into the corroding liquor. Lay it on some cotton, on a pedestal, and cover it with a glass.

Liver.—The liver of a child is to be preferred to that of an adult, it occupying much less room: its vessels should be cut long, and with it the portion of the duodenum, perforated by the bile duct.

Fix a pipe into the hepatic artery, another into

the vena portæ, a third into the ductus communis choledochus, and a fourth in the vena cava hepatica. The four injections are the red, yellow, dark blue, and light blue. First, throw the red injection into the hepatic artery, next the dark blue into the vena portæ, then the light blue into the cava hepaticæ, and lastly, the yellow into the ductus communis choledochus. Remove the pipes as soon as the injection will permit; and, when corroded, fix the trunks in the best manner possible, upon a proper pedestal; then wash away the flesh, dry it, and cover it with a glass.

Kidney.—Choose the kidney of an old drunkard. Cut the emulgent vessels close to the aorta and cava, and the ureter, very low; then remove the kidney, with all its surrounding adeps.

Soak out the blood, and press out all the fluid. Fix a pipe in the emulgent artery, another in the vein, and a third in the ureter; and tie up all the open-mouthed vessels.

Red, blue, and yellow. First throw the yellow into the vein, then the red into the artery, and lastly, the blue into the ureter.

Preserve under a glass bell. The kidneys of different animals form a beautiful exhibition.

It hence appears then, in few words, that the manner of preserving anatomical preparations is either by drying them thoroughly in the air, or putting them into a proper liquor. In drying parts which are thick, when the weather is warm, care must be taken to prevent putrefaction, flyblows, insects, &c. This is easily done by the use of a solution of corrosive sublimate in spirit of wine, in the proportion of two drams of sublimate to a pound of spirit: the part should be moistened with this liquor as it dries, and by this method the body of a child may be kept safe even in summer. Dried preparations are apt to crack and moulder away in keeping; to prevent this, their surface should be covered with a thick varnish, repeated as often as occasion requires.

Though several parts prepared dry are useful, yet others must be so managed as to be always flexible, and nearer a natural state. The difficulty has been to find a proper liquor for this purpose. Dr. Monro says, the best he knows is a well rectified colourless spirit of wine, to which is added a small quantity of the spirit of vitriol or nitre. When these are properly mixed, they neither change their colour nor the consistence of the parts, except where there are serous or mucous liquors contained in them. The brain, even of a young child, in this mixture grows so firm as to admit of gentle handling, as do also the vitreous and crystalline humours of the eye. The liquor of the sebaceous glands and the semen are coagulated by this spirituous mixture; and it heightens the red colour of the injection of the blood-vessels, so that after the part has been in it a little time, several vessels appear which were before invisible. If you will compare these effects with what Ruysch has said of his balsam, you will find the liquor above-mentioned to come very near to it.

The proportion of the two spirits must be changed according to the part prepared. For the brain and humours of the eye, you must put two drams of spirit of nitre to one pound of spirit of wine. In preserving other parts which are harder, 30 or 40 drops of the acid will be sufficient; a larger quantity will make bones flexible, and even dissolve them.

Dr. Christ. Jac. Trew prefers the rectified spirit of grain for preserving anatomical preparations to

spirit of wine, or to compositions of alcohol, amber, camphor, &c. because these soon change into a brown colour, whereas the spirit from malt preserves its limpid appearance. When any part is to be preserved wet, wash it with water till it is no more tinged. The water is next to be washed away with spirits, and then the preparation is to be put among spirits in a glass, the mouth of which is to be closely covered with a glass head, over which a wet bladder and leaf-tin are to be tied. Com. Lit. Norimb. 1731, semest. 1 specim. 9. See also Pole's Anatomical Instructor, and American Transactions, vol. ii. p. 366.

II. PREPARATION OF VEGETABLES.

This is of as essential consequence to a thorough knowledge of botany, as the preparation of animals is to a thorough knowledge of zoology or anatomy. The plant or part of a plant in this process is first carefully dried, and then pasted into blank books of sufficient magnitude for their reception without being cramped. The volumes thus filled are denominated a *HORTUS SICCUS*; and as we have described the method of drying plants and pasting them into volumes under that name, we shall refer the reader to the article which it contains.

PREPARATION OF DISCORDS. See MUSIC.

PREPARATIONS, in pharmacy, the medicines when mixed together in such a manner as to be fit for the use of the patient. See PHARMACY.

PREPARATIVE. a. (*preparatif*, French.) Having the power of preparing, qualifying, or fitting (*South*).

PREPARATIVE. s. (*preparatif*, French.) 1. That which has the power of preparing or previously fitting (*Decay of Piety*). 2. That which is done in order to something else (*King Charles*).

PREPARATIVELY. ad. (from *preparative*.) Previously; by way of preparation (*Hale*).

PREPARATORY. a. (*preparatoire*, Fr.) 1. Antecedently necessary (*Tillotson*). 2. Introductory; previous; antecedent (*Hale*).

To PREPARE. v. a. (*præparo*, Lat.) 1. To fit for any thing; to adjust to any use; to make ready for any purpose (*Blackmore*). 2. To qualify for any purpose (*Addison*). 3. To make ready beforehand (*Milton*). 4. To form; to make (*Psalms*). 5. To make by regular process; as, he prepared a medicine.

To PREPARE. v. n. 1. To take previous measures (*Peacham*). 2. To make every thing ready; to put things in order (*Shakspeare*). 3. To make one's self ready; to put himself in a state of expectation.

PREPARE. s. (from the verb.) Preparation; previous measures: not in use (*Shakspeare*).

PREPAREDLY. ad. (from *prepared*.) By proper precedent measures (*Shakspeare*).

PREPAREDNESS. s. (from *prepare*.) State or act of being prepared.

PREPARER. s. (from *prepare*.) 1. One that prepares; one that previously fits (*Wotton*). 2. That which fits for any thing (*Mortimer*).

PREPENSE. **PREPENSED.** *a.* (*præpensus*, Lat.) Fore-thought; preconceived; contrived beforehand: as, *malice prepense*.

To PREPONDER. *v. a.* (from *preponderate*.) To outweigh: not used (*Wotton*).

PREPONDERANCE. **PREPONDERANCY.** *s.* (from *preponderate*.) The state of outweighing; superiority of weight (*Locke*).

To PREPONDERATE. *v. a.* (*prepondero*, Latin.) 1. To outweigh; to overpower by weight (*Glanville*). 2. To overpower by stronger influence.

To PREPONDERATE. *v. n.* 1. To exceed in weight (*Bentley*). 2. To exceed in influence or power analogous to weight (*Locke*).

PREPONDERATION. *s.* (from *preponderate*.) The act or state of outweighing any thing (*Watts*).

To PREPOSE. *v. a.* (*proposer*, Fr.) To put before.

PREPOSITION. *s.* (*preposition*, Fr. *præpositio*, Lat.) In grammar, a particle governing a case. See **GRAMMAR**.

PREPOSITOR. *s.* (*præpositor*, Latin.) A scholar appointed by the master to overlook the rest.

To PREPOSSESS. *v. a.* (*pre* and *possess*.) To fill with an opinion unexamined; to prejudice (*Wiseman*).

PREPOSSESSION. *s.* (from *prepossess*.) 1. Preoccupation; first possession (*Hammond*). 2. Prejudice; preconceived opinion.

PREPOSTEROUS. *a.* (*præposterus*, Lat.) 1. Having that first which ought to be last (*Woodward*). 2. Wrong; absurd; perverted (*Denham*). 3. Applied to persons: foolish; absurd (*Shakspeare*).

PREPOSTEROUSLY. *ad.* In a wrong situation; absurdly (*Bentley*).

PREPOSTEROUNESS. *s.* (from *preposterous*.) Absurdity; wrong order or method.

PREPOTENCY. *s.* (*præpotentia*, Latin.) Superiour power; predominance (*Brown*).

PREPUCE. *s.* (*præputium*, Latin.) That which covers the glans; foreskin. See **ANATOMY**.

To PRE REQUIRE. *v. a.* (*pre* and *require*.) To demand previously (*Hammond*).

PREREQUISITE. *a.* (*pre* and *requisite*.) Previously necessary (*Hale*).

PREROGATIVE. *s.* (*prerogatif*, French.) An exclusive or peculiar privilege (*Sidney*).

PREROGATIVE (Royal), in law, means all the rights and privileges which by law the king hath, as chief of the commonwealth, and as intrusted with the execution of the laws; and this can be only according to magna charta. We shall here briefly set down those articles which are enumerated by lord chief baron Comyns, in his Digest, as belonging to the king's prerogative, premising only, that many things are laid down in our law-books from ancient authorities, which do not thoroughly accord with the spirit of the constitution, as improved at the revolution; and that every thing which is contrary to that glorious spirit may be well

questioned to be law at the present day. Those who were formerly called prerogative lawyers were little better than the willing slaves of absolute monarchy.

As to his domestic concerns, the care of the marriages in the royal family belongs to the king, and is now regulated by statute 12 George III. c. 11.

As to foreign nations, he has the sovereignty of the seas surrounding England, and may make treaties and alliances, and send ambassadors and envoys to foreign states, and a league is said to be broken by a prohibition of all the commodities of a kingdom in amity. He may, in virtue of the same right, grant reprisals, by taking the goods of foreign subjects, here or elsewhere, and he is entitled to all prizes; but, by certain acts called the prize-acts, they are distributed in certain shares amongst the captors, according to a proclamation to be made in every new war, and 5l. a head is allowed to ships of war for every man killed. The king may also grant letters of safe conduct to an enemy here; and without these, it is said, a foreign prince, though in amity, cannot come here.

With respect to the king's own subjects, he has the sole authority to declare war or peace, and to levy soldiers, and by 11 Henry VII. c. 1. and 18, every man is bound to serve the king in his wars, but not out of the realm, except for wages; nor can he be sent out of the kingdom even with an office. In like manner, the right of impressing seamen is acknowledged; but it must not be exercised wantonly, as by taking a captain of a merchantman to serve as a common man, and, by 13 George II. c. 17, persons of fifty-five years of age, and under eighteen, and every person going to sea for two years, and every apprentice during three years, are exempted; and also all foreigners; besides which there are other particular exemptions; nor are mariners, except deserters, to be impressed in the West Indies. He has also the sole command of the forces, as well militia as regulars, and that, by 13 Charles II. c. 6, independent of the houses of parliament. His troops may be billeted all over the kingdom; and no one but the king can build forts.

With respect to time of peace, he enacts laws, together with his parliament; but cannot by grant or charter alter the law. He may issue proclamations to enforce laws; and by 1 James, c. 25, and 12 Charles II. 4, s. 12; may restrain the transportation of corn, and gunpowder, arms, and ammunition, generally, or from particular places. By statute 31 Henry VIII. since repealed, he might, in effect, make new laws by his proclamation. But now he cannot suspend the execution of a law for any time, as till the meeting of the next parliament. It is said, that the king may dispense with a thing prohibited, so as to make it lawful, in case of necessity, to the party to do the prohibited thing; but dispensations are odious, and, indeed, except under the following limitations, the king's dispensing power may now

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be questioned. As, however, he may grant a pardon when the offence is committed, it seems not of so much importance. He may unquestionably dispense with any thing which is for his benefit, as a penalty due to the king; but not with a thing *malum in se*, nor in which the subject has an interest. He may grant a pardon of all offences, as well in the ecclesiastical as the criminal court; but cannot reverse a judgment without process.

With respect to things ecclesiastical, he has jurisdiction in all ecclesiastical causes, is head of the church, and may punish and repress heresies and superstitions, by statute 37 Henry VIII. c. 17. And ecclesiastical laws, which consist of ancient synods, and canons, and constitutions, and customs, formed with the assent of the king, without the parliament, are of legal authority in England, and, it is said, he may dispense with those laws. He may, with his commissioners, pass ecclesiastical censure, and shall have the ordering of all ecclesiastical appeals, without appeal to the pope. The highest appeal, by statute 25 Henry VIII. c. 19, is to the king, in chancery, who issues a commission to his delegates; but where the king is concerned; it is to the upper house of convocation; and although the appeal to the delegates is final, yet the king may grant a commission of review.

The king's prerogative, as to temporal jurisdiction, enables him to make what courts he pleases, for the administration of the common law, and where he pleases; but he cannot erect a court of chancery, or conscience, the common law being the birthright of the subject. The king may also grant such commissions as are warranted or allowed by the common or statute law, as of oyer and terminer, &c.; but, it is said, he cannot grant a commission of inquiry only, without a clause to hear and determine. He may grant franchises also, because all franchises and liberties are derived from him, as a county palatine, or jurisdiction temporal, or ecclesiastical.

As to nobility and honour, the king is the fountain of all dignity, and may, it is said, compel all persons of 20l. per annum inheritance to be knights, or persons named to be sergeants to take the degree.

The king may also grant privileges, such as those of a forest, chase, warren, park, fair, market, with tolls, or casual profits, as wreck, waifs, strays, deodands, treasuretrove, royal fish, mines, derelict lands, most of which belong to the king, together with certain privileges in trade, for which see TRADE. So he may grant exemptions from those charges which, by his grant, he may impose, as to be quit of toll for merchandise, in every town in England, and to be exempt from offices under the crown, such as that of constable, provided there be a sufficient number to serve; but he cannot grant an exemption from the jurisdiction of any court, if he does not erect a jurisdiction of the same nature in lieu of it, for that would create a failure of justice; nor to be

exempt from punishment from felony or trespass. He may also by proclamation or special writ, directed to the party, or to the sheriff, restrain any person from quitting the kingdom, and may, for reasons of state, lay an embargo upon a ship. So he may inhibit a public nuisance. He may also recalc, by summons, a subject who goes out of the kingdom with or without licence, and if he returns not, upon service of summons, then his lands and goods are forfeited. But, it is said, merchants may abide beyond sea, and a king, in amity, need not deliver up those who fly to him.

The king may, by his prerogative, command mayors and corporate officers to restrain annoyances, and keep streets clean; but not in places which are no corporations; and cannot inhibit a lawful occupation, such as making cards, under pretence of inconvenience, nor restrain the exercise of foot-ball, cock-fighting, or other vain sports, except, perhaps, on Sundays.

As to offices, the king has the nomination of all public officers within the kingdom; but he cannot create a new office with a fee, nor appoint an old office with a new fee, to burthen the public, without his parliament.

As to trade, he may erect societies for the management of it; but cannot grant an embargo on ships, for the benefit of a private trader or company.

As to matters of revenue, the king can alone coin money within his dominions, upon which the duties are now settled, as in statute 18 Charles II.; but the aid, for knighthood, marriage, &c. are taken away by statute 12 Charles II. c. 24.

With respect to purveyance, he may dig for saltpetre in the lands, stables, and other places of a subject; but not where he cannot leave the place in the same plight as before. He must leave room for the horses, &c. of the person, and not dig at improper times, nor return there for a long time, nor can he grant it to another, and the saltpetre must be used for the defence of the realm only, and the subject is at liberty still to dig in his own soil. But he cannot claim any other necessities, such as timber, wood, fuel, cattle, grain, hay, victuals, carts, carriages, &c. without the consent of the owner, by statute 12 Charles II. c. 24.

The customs upon merchandise exported and imported are the ancient inheritance of the crown, which, it is said, were originally by act of parliament; they were distinguished into *customa magna, et parva*, to which were added prisage, or a duty of two tons out of every ship laden with twenty tons of wine; and butlerage, or a levy of 2s. per ton, for every ton of wine of a merchant stranger. The citizens of London were exempt from this duty in the port of London. These duties, it seems, are now repealed by statute 27 George III. c. 13, called the consolidation act, which affixes a certain rate to the commodities therein enumerated, and 27l. 10s. per cent. with a drawback of 25l. per cent. on exportation, upon every other commodity. We have, how-

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ever, read in the public prints during this year, (1807) of the claim of prisage being made in Ireland, by one of the grantees of the crown, and allowed; but we presume, so heavy a tax, if it can be claimed, in addition to the duty on wines, must be repealed by parliament. Customs are not paid where the king has granted goods of a pirate to a patentee, for the king shall not pay custom to himself; and it is said, the king may grant to an alien to pay no more customs than a subject; but this must be subject to the consolidation act.

The king may, by his prerogative, charge an imposition upon the subject for his benefit, as he may grant a certain rate for things sold in a town, for the walls of the town, or repairing the bridge, or the security of those parts. Or that a man may build a wall, or keep a ferry, and take toll for the support of it. But he cannot charge the subject where he has no benefit from it, or a *quid pro quo*, nor levy new customs, &c. Nor can the merchants, by their consent, grant to the king a tax upon their goods, for their wares would thereby be sold the dearer. Upon all which we must observe that it should appear this branch of the prerogative is fallen into disuse, and can scarcely now be claimed as being altogether inconsistent with the spirit of the revolution in 1688. And we now see that in all cases where a pier is to be built, or a turnpike-road made, or improvements are made in cities, application is had to parliament, and a bill is passed. This, it is true, may be partly, because it is often necessary to borrow large sums of money, and to purchase lands by compulsion, &c.; but we still may venture to question this prerogative, although we find it in books of great authority previously to the reigns of Charles the First and Second.

As to casual profits, the king is entitled to all goods which have no owner, as, wreck, flotsan, jetsan, and ligan, waifs, strays, goods of felons, deadlands, treasure-troves, escheats, and lands forfeited. He is entitled also to royal mines, and the fishery of every navigable river, as high as the sea flows: but every one may fish in the sea of a common-right, although foreign nations cannot fish in the British Seas, without the king's licence. There are also certain fines, upon legal proceedings, which the king claims by his prerogative; and anciently, a fine was paid for liberty to have right and justice, which is now abolished by *magna charta* 29, *nulli vendemus*, &c. So fines for beau pleader, for grants of liberties, and for misdemeanors, with all americiaments which are levied by the sheriff and estreated into the exchequer.

All the lands in the kingdom, it is said, are holden mediately, or immediately, of the king, who has no superior; and this is the foundation of the law of forfeiture and escheats: but this, however in practice it may be harmless, is a principle rather derived from the divine right of kings, than the spirit of the revolution, which considers the king rather as deriv-

ing every thing from the people, and holding the throne itself in trust.

Whatsoever lands, or tenements, the king has, belong to him in right of his crown, and are called the sacred patrimony, or demesnes of the crown, says lord Coke; and whether lands descend, or are devised, or given to him and his heirs by statute, or otherwise, they go as parcel of the crown. The king, therefore, it seems, cannot divest himself of his public character, but has all his real possessions, for it does not seem to extend to money, merely as king.

All conveyances to the king ought to be, by deed, enrolled; and where a subject would not have possession without entry, there the king has it not without office found, or other record. But if the king's title is so found upon an inquisition, he is in possession without seizure; and where a common person cannot enter without an action, there the king ought to have a *scire facias*. But no office is necessary where the king's title appears by other matter of record, and where he is so seised he can never be ejected, or disseised; but every one who enters upon his possessions is called an intruder; the remedy upon which is by an information of intrusion. The remedy against the king is by petition to the king in parliament, in chancery, or some other court, for there can be no writ, because the king cannot command himself as it is quaintly expressed. There is also another proceeding by *monstrance de droit*, which is, where the suitor's title appears by the same record as that of the king. Even upon an office found there may now be, by statute 34 Edward III. c. 14, a traverse, denial, or litigation of it.

The king, by his prerogative, may sue in what court he pleases, and shall not be prejudiced by any neglect to pursue his right, which is meant by the maxim *nulium tempus*, &c. or no time runs against the king. Though now, by statute 9 George III. c. 16, the king's suit, except for liberties and franchises, is limited, under certain conditions, to 60 years for lands.

As to the disposal of the personal revenue of the king, this can only be by the great, or privy seal; and every one who receives money out of the exchequer, without due warrant, is accountable for it. He may, it is said, dispose of his lands and other real revenues of inheritance, by patent, to others, when he pleases. And by statute 1 Anne 7, s. 5, all grants by the king of any manors, lands, &c. advowsons of churches and vicarages excepted, shall be void, except for 31 years or under, or for three lives, &c. subject to waste, and at the usual rent or more, or if no usual rent, then a rent at least one-third of the annual value. By the same act, the hereditary excise, revenue of the post-office, first fruits and tenths, fines for writs of covenant, and entry at the alienation office, post fines, wine licences, sheriffs profers, and compositions, and seizures for unaccustomed and prohibited goods, shall not be alienable for

longer than the life of the king who grants them.

It is to be observed that much of the king's prerogative, producing revenue, has been from time to time granted out with various manors; and the article of forfeitures, which might in some cases be somewhat profitable, is very little enforced. When a forfeiture is discovered, the officers of the crown generally allow a portion to the informer; sometimes one-sixth. It has been proposed, by Mr. Bentham, to make forfeitures of land supply, in some measure, the place of taxes, and to restrain the power of bequest of land to certain degrees of kindred only. Blackstone and others, however, though they approve of the statute of Anne to prevent the improperly granting away crown lands, consider the great diminution of the landed demesnes of the crown well exchanged by the subject for the lighter burthen of taxes, since, had things remained as at the conquest, the king would, by forfeiture and otherwise, have possessed all the land in the kingdom. The observation is short-sighted enough, for no people would have tolerated it. William possessed all the lands by force, only to parcel them out like a robber among his troops; and had he not speedily parted with them, he and they must have found that he who grasps all loses all. See REVENUE.

PREROGATIVE COURT, the court wherein all wills are proved, and all administrations taken, which belong to the archbishop by his prerogative; that is, in cases where the deceased had goods of any considerable value out of the diocese wherein he died; and that value is ordinarily 5*l.* except it be otherwise, by composition, between the archbishop and some other bishop, as in the diocese of London, it is 10*l.*

PREROGATIVED. *a.* (from *prerogative*.) Having an exclusive privilege (*Shakspeare*).

PRESAGE. *s.* (*presage*, French; *præsigium*, Lat.) Prognostic; presension of futurity (*Addison*).

To **PRESAGE.** *v. n.* (*presager*, French; *præsigio*, Latin.) 1. To forebode; to foreknow; to foretel; to prophesy (*Milton*). 2. To foretoken; to foreshow (*Shakspeare*).

PRESAGEMENT. *s.* (from *presage*.) 1. Forebodement; presension (*Wotton*). 2. Foretoken (*Brown*).

PRESBURG, the capital of the kingdom of Lower Hungary, called by the inhabitants Posony and Presporen, situated on the Danube, about 46 miles east from Vienna, and 75 from Buda. The castle, in which the regalia are kept, stands on a hill above the town. Here the states assemble; and in the cathedral, dedicated to St. Martin, the king is crowned. The town is not very large, nor well built; but is very ancient, pleasantly situated, and enjoys a good air. Its fortifications are only a double wall and ditch. In the lower suburbs is a hill, where the king, after his coronation, goes on horseback, and brandishes St. Stephen's

sword towards the four cardinal points, intimating, that he will defend his country against all its enemies. Besides the cathedral, there are several other Popish and one Lutheran church, with a Jesuits college, three convents, and two hospitals. It gives name to a county; and is the residence of the archbishop of Gran, who is primate, chief secretary, and chancellor of the kingdom, *legatus natus* of the Papacy, and prince of the holy Roman empire. Lon. 17. 30 E. Lat. 48. 20 N.

PRESBYOPIA. (*πρεσβυωπια*, from *πρεσβυς*, old, and *ως*, sight; because it is frequent with old men.) That defect of the sight by which objects close are seen confusedly, but at remoter distances, distinctly. As the myopia is common to infants, so the presbyopia is a malady common to the aged. The proximate cause is a tardy adunation into the focus, so that it falls beyond the retina. The species are, 1. Presbyopia from a flatness of the cornea. By so much the cornea is flatter, so much the less and more tardy it refranges the rays into the focus. This evil arises, 1st, from a want of aqueous or vitreous humour, which is common to the aged; or may arise from some disease; 2d, from a cicatrix, which diminishes the convexity of the cornea; 3d, from a natural conformation of the cornea. 2. Presbyopia from too flat a crystalline lens. This evil is most common to the aged, or it may happen from a wasting of the crystalline lens. 3. Presbyopia from too small density of the cornea or humours of the eye. By so much more these humours are thin or rarified, so much the less they refrange the rays of light. Whosoever is a myops from this cause is cured in older age; for age induces to a greater density of the cornea and lens. From this it is an observed fact, that the presbyopes are often cured spontaneously, and throw away their glasses, which younger persons in this disease are obliged to use. 4. Presbyopia from a custom of viewing continually remote objects; hence artificers who are occupied in remote objects are said to contract this malady. The reason of this phenomenon is not very clear. 5. Presbyopia senilis. From a multitude of causes aged persons are presbyopes; from a penury of humours, which render the cornea and lens flatter, and the bulb shorter. When in senile age, from dryness, the bulb of the eye becomes flatter and shorter, and the cornea flatter, those who were short-sighted or myopes before, see now without their concave glasses. 6. Presbyopia from too close a proximity of objects. The focus is shorter of distant, but longer of nearer objects. 7. Presbyopia from a coarctated pupil. By so much smaller is the aperture of the diaphragm in an optic tube, so much remoter is the focus. 8. Presbyopia mercurialis, which arises from the use of mercurial preparations. The patient feels a pressing pain in the eye, which, from being touched is increased, and the bulb of the eye appears as if rigid, and with difficulty can be moved. Near objects the patient can scarce distinguish, and distant only

in a confused manner. Many have supposed this disorder an imperfect amaurosis.

PRESBYTÆ, persons who are afflicted with the disorder of the sight called presbyopia. See the preceding article.

PRESBYTER, a priest, or person in priest's orders. He is thus called from the Greek *πρεσβύτερος*, elder; of *πρεσβυς*, old; because, anciently, none were ordained but such as were advanced in years.

The great dispute between the retainers to the Geneva and the Roman discipline is, about the sameness or difference of presbyters and bishops, in the times of the apostles.

Those who consult Acts xx. 17, 28. Phil. i. 1. Tit. i. 5. 7. and 1 Tim. iii. 1. may perhaps be led to conclude, that these titles were applied to the same persons.

The learned bishop Usher expressly says, "I have ever declared my opinion to be, that *episcopus et presbyter gradu tantum differunt, non ordine*; and consequently, that in places where bishops cannot be had, the ordination by presbyters stands valid." And being asked by his majesty at the Isle of Wight, "Whether he found in antiquity, that presbyters alone ordained any?" he replied, "Yes; and that he could shew his majesty more; even where presbyters alone successively ordained bishops;" and instanced in Jerom's words (*Epist. ad Evagrium*) of the presbyters of Alexandria choosing and making their own bishops from the days of Mark, till Heraclius and Dionysius. Baxter's Life, p. 206.

This was the constant sense of our first reformers, Cranmer, Pilkington, Jewel, Grindal, Whitgift, Bancroft, &c. Bishop Burnet expressly says, "As for the notion of distinct offices of bishop and presbyter, I confess, it is not so clear to me; and therefore since I look upon the sacramental actions as the highest of sacred performances, I cannot but acknowledge those who are empowered for them must be of the highest office in the church." Vind. of the Church of Scotland, pa. 336. See **BTSHOP**.

PRESBYTERIAL. PRESBYTERIAN. a. (*πρεσβυτερικόν*.) Consisting of elders; a term for a modern form of ecclesiastical government (*Holyday. King Charles*).

PRESBYTERIANS, a denomination comprehending a very considerable number of persons in Great Britain; but very differently applied in England and Scotland. The English presbyterians do not materially differ from the independents with regard to church-government and discipline, and mode of worship; but they generally allow a much greater latitude of religious sentiments and communion in their churches. The appellation, in this restricted use of it, implies no attachment to the authority of synods, presbyteries, or ecclesiastical assemblies composed of deputies from different churches, any more than to episcopacy and the ecclesiastical hierarchy; and, therefore, according to its original use, it is improperly applied to many who are now distinguished by

it, and who form a very respectable class of nonconformists, or protestant dissenters in this kingdom. See **INDEPENDENTS**.

But the presbyterians, properly so called, that is, those of the established church of Scotland, maintain that the government of the church appointed in the New Testament was by presbyteries, that is, by associations of ministers and ruling elders, possessed all of equal powers, without any superiority among them either in office or in order.

The presbyterians believe, that the authority of their ministers to preach the gospel, to administer the sacraments of baptism and the Lord's supper, and to feed the flock of Christ, is derived from the Holy Ghost by the imposition of the hands of the presbytery; and they oppose the independent scheme of the common rights of Christians by the same arguments which are used for that purpose by the episcopalians (see **EPISCOPACY**). They affirm, however, that there is no order in the church as established by Christ and his apostles superior to that of presbyters; that all ministers, being ambassadors of Christ, are equal by their commission; that presbyter and bishop, though different words, are of the same import; and that prelacy was gradually established upon the primitive practice of making the moderator or speaker of the presbytery a permanent officer.

These positions they maintain against the episcopalians by a great variety of arguments, and tenets of scripture.

The presbyterians of Scotland say that their church is formed upon the primitive model. Her mode of worship, say they, is simple and solemn; her established faith agreeable to the confessions of most other protestant churches; her judicatories are calculated to maintain the rights of the people; and her pastors are men of liberal minds. We cannot therefore more properly continue this article than with a short view of her constitution.

No one is ignorant, that from the first dawn of reformation in Scotland, till the era of the revolution, there was a perpetual struggle between the court and the people for the establishment of an episcopal or a presbyterian form of church government. The former model of ecclesiastical polity was patronised by the house of Stuart on account of the support which it gave to the prerogatives of the crown; the latter was the favourite of the majority of the people, perhaps not so much on account of its superior claim to apostolical institution, as because the laity are mixed with the clergy in church judicatories, and the two orders, which under episcopacy are kept so distinct, incorporated, as it were, into one body. In the Scottish church, every regulation of public worship, every act of discipline, and ever ecclesiastical censure, which in other churches flows from the authority of a diocesan bishop, or from a convocation of the clergy, is the joint work of a certain number of clergymen and laymen acting together with equal authority, and de-

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ending every question by a plurality of voices. The laymen who thus form an essential part of the ecclesiastical courts of Scotland, are called ruling elders; and hold the same office, as well as the same name, with those brethren who joined with the apostles and elders at Jerusalem in determining the important question concerning the necessity of imposing upon the Gentile converts the ritual observances of the law of Moses. These lay-elders Paul enjoined Timothy to account worthy of double honour, if they should rule well, and discharge the duties for which they were separated from the multitude of their brethren. In the church of Scotland every parish has two or three of those lay-elders, who are grave and serious persons chosen from among the heads of families, of known orthodoxy and steady adherence to the worship, discipline, and government of the church. Being solemnly engaged to use their utmost endeavours for the suppression of vice and the cherishing of piety and virtue, and to exercise discipline faithfully and diligently, the minister, in the presence of the congregation, sets them apart to their office by solemn prayer; and concludes the ceremony, which is sometimes called ordination, with exhorting both elders and people to their respective duties.

The kirk-sessions, which is the lowest ecclesiastical judicatory, consists of the minister and those elders of the congregation. The minister is *ex officio* moderator, but has no negative voice over the decision of the session; nor indeed has he a right to vote at all, unless when the voices of the elders are equal and opposite. He may indeed enter his protest against their sentence, if he think it improper, and appeal to the judgment of the presbytery; but this privilege belongs equally to every elder, as well as to every person who may believe himself aggrieved by the proceedings of the session. The deacons, whose proper office it is to take care of the poor, may be present in every session, and offer their counsel on all questions that come before it; but, except in what relates to the distribution of alms, they have no decisive vote with the minister and elders.

The next judicatory is the presbytery, which consists of all the pastors within a certain district, and one ruling elder from each parish commissioned by his brethren to represent, in conjunction with the minister, the session of that parish. The presbytery treats of such matters as concern the particular churches within its limits; as the examination, admission, ordination, and censuring of ministers; the licensing of probationers, rebuking of gross or contumacious sinners, the directing of the sentence of excommunication, the deciding upon references and appeals from kirk-sessions, resolving cases of conscience, explaining difficulties in doctrine or discipline; and censuring, according to the word of God, any heresy, or erroneous doctrine which hath been either publicly or privately maintained within the bounds of its jurisdiction. One part of the

constitution of the church of Scotland gives an equal vote, in questions of heresy, to an illiterate mechanic and his enlightened pastor. This has been the source of trouble to many a clergyman; who, from the laudable desire of explaining the scriptures and declaring to his flock all the counsel of God, has employed a variety of expressions of the same import, to illustrate those articles of faith which may be obscurely expressed in the established standards. The fact however is, that, in presbyteries, the only prerogatives which the pastors have over the ruling elders, are the power of ordination by imposition of hands, and the privilege of having the moderator chosen from their body.

From the judgment of the presbytery there lies an appeal to the provincial synod, which ordinarily meets twice in the year, and exercises over the presbyteries within the province a jurisdiction similar to that which is vested in each presbytery over the several kirk-sessions within its bounds. Of these synods there are in the church of Scotland fifteen, which are composed of the members of the several presbyteries within the respective provinces which give names to the synods.

The highest authority in the church of Scotland is the general assembly, which consists of a certain number of ministers and ruling elders delegated from each presbytery, and of commissioners from the universities and royal boroughs. A presbytery in which there are fewer than twelve parishes, sends to the general assembly two ministers and one ruling elder; if it contain between 12 and 18 ministers, it sends three of these, and one ruling elder; if it contain between 18 and 24 ministers, it sends four ministers and two ruling elders; and of 24 ministers, when it contains so many, it sends five, with two ruling elders. Every royal borough sends one ruling elder, and Edinburgh two; whose election must be attested by the kirk-sessions of their respective boroughs. Every university sends one commissioner from its own body. The commissioners are chosen annually six weeks before the meeting of the assembly; and the ruling elders are often men of the first eminence in the kingdom for rank and talents. In this assembly, which meets once a year, the king presides by his commissioner, who is always a nobleman; but he has no voice in their deliberations. The order of their proceedings is regular, though sometimes the number of members creates a confusion, which the moderator, who is chosen from among the ministers, to be as it were the speaker of the house, has not sufficient authority to prevent. Appeals are brought from all the other ecclesiastical courts in Scotland to the general assembly; and in questions purely religious no appeal lies from its determinations.—In the subordination of these assemblies, parochial, presbyterial, provincial, and national, the less unto the greater, consist the external order, strength, and steadfastness of the church of Scotland.

PRESBYTERY, *s.* (from *presbyter*.)

Body of elders, whether priests or laymen (*Cleveland*).

PRESCIENCE. *s.* (*prescience*, Fr.) Foreknowledge; knowledge of future things (*Sou.*).

PRESCIENT. *a.* (*præsciens*, Lat.) Foreknowledge; prophetic (*Bacon*).

PRESCIOUS. *a.* (*præsciens*, Lat.) Having foreknowledge (*Dryden*).

To PRESCIND. *v. a.* (*præscindo*, Latin.)

To cut off; to abstract (*Norris*).

PRESCINDENT. *a.* (*præscindens*, Lat.) Abstracting (*Cheyne*).

To PRESCRIBE. *v. a.* (*præscribo*, Lat.)

1. To set down authoritatively; to order; to direct (*Hooker*). 2. To direct medically (*Swift*).

To PRESCRIBE. *v. n.* 1. To influence by long custom (*Brown*). 2. To influence arbitrarily (*Locke*). 3. (*prescrire*, Fr.) To form a custom which has the force of law (*Arbuthnot*). 4. To write medical directions and forms of medicine (*Pope*).

PRESCRIPT. *a.* (*præscriptus*, Latin.) Directed; accurately laid down in a precept (*Hooker*).

PRESCRIPT. *s.* (*præscriptum*, Latin.) 1. Direction; precept; model prescribed (*Milton*). 2. Medical order (*Fell*).

PRESCRIPTION. *s.* (*præscriptio*, Lat.) 1. Rules produced and authorized by long custom; custom continued till it has the force of law (*South*). 2. Medical receipt (*Temple*).

PRESEANCE. *s.* (*preseance*, Fr.) Priority of place in sitting: not used (*Carew*).

PRESENCE. *s.* (*presence*, Fr. *præsentia*, Latin.) 1. State of being present; contrary to absence (*Shakspeare*). 2. Approach face to face to a great personage (*Daniel*). 3. State of being in the view of a superiour (*Milton*). 4. A number assembled before a great person (*Shakspeare*). 5. Port; air; mien; demeanour (*Collier*). 6. Room in which a prince shows himself to his court (*Spenser*). 7. Readiness at need; quickness at expedients (*Waller*). 8. The person of a superiour (*Milton*).

PRESENCE-CHAMBER. PRESENCE-ROOM. *s.* (*presence and chamber or room*.) The room in which a great person receives company (*Addison*).

PRESENTION. *s.* (*præsentio*, Lat.) Perception beforehand (*Brown*).

PRESENT. *a.* (*present*, Fr. *præsens*, Lat.)

1. Not absent; being face to face; being at hand (*Taylor*). 2. Not past; not future (*Prior*). 3. Ready at hand; quick in emergencies (*L'Estrange*). 4. Favourably attentive; not neglectful; propitious (*Ben Jonson*). 5. Unforgotten; not neglected (*Watts*). 6. Not abstracted; not absent of mind; attentive. 7. Being now in view; being now under consideration (*Law*).

The PRESENT. An elliptical expression for the present time; the time now existing (*Rowe*).

At PRESENT. (*à present*, Fr.) At the present time; now (*Addison*).

PRESENT. *s.* (*present*, French.) 1. A gift;
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a donative; something ceremoniously given (*Shakspeare*). 2. A letter or mandate exhibited (*Shakspeare*).

To PRESENT. *v. a.* (*præsento*, low Latin.)

1. To place in the presence of a superior (*Milton*). 2. To exhibit to view or notice (*Shakspeare*). 3. To offer; to exhibit (*Milton*). 4. To give formally and ceremoniously (*Prior*). 5. To put into the hands of another (*Dryden*). 6. To favour with gifts (*Dryden*). 7. To prefer to ecclesiastical benefices (*Atterbury*). 8. To offer openly (*Hayward*). 9. To introduce by something exhibited to the view or notice: not in use (*Spenser*). 10. To lay before a court of judicature, as an object of inquiry (*Swift*). 11. To point a missile weapon before it is discharged.

PRESENTABLE. *a.* (from *present*.) What may be presented (*Ayliffe*).

PRESENTA'NEOUS. *a.* (*præsentaneus*, Lat.) Ready; quick; immediate (*Harvey*).

PRESENTA'TION. *s.* (*presentation*, Fr.)

1. The act of presenting (*Hooker*). 2. The act of offering any one to an ecclesiastical benefice (*Hale*). 3. Exhibition (*Dryden*).

PRESENTATION, in law, the act of a patron offering his clerk to be instituted in a benefice of his gift, the same being void. All persons that have ability to make a purchase or grant may also present to vacant benefices in their gift; though where a clergyman is patron of a church, he cannot present himself, but may pray to be admitted by the bishop, and the admission shall be effectual. An infant of any age may also present in his own name; but a presentation by a feme covert must be in the name of both husband and wife. As coparceners make but one patron, they are either to present jointly, or the eldest may present first, and the rest in their turn. Joint-tenants must also join in a presentation; and when a corporation presents, it must be under their common seal. Aliens born and papists cannot present to benefices, which are presented to by the universities; but a popish recusant may grant his patronage to another, who may present where there is no fraud. A patron may revoke his presentation before institution, but not afterwards; and a right of presenting to the next avoidance of a church, whether granted by will or deed, will pass; but a presentation whilst the church is full is judged void.

PRESENTATIVE. *a.* (from *present*.) Such as that presentations may be made of it (*Spel.*).

PRESENTE'E. *s.* (from *présenté*, Fr.) One presented to a benefice (*Ayliffe*).

PRESENTER. *s.* (from *present*.) One that presents (*L'Estrange*).

PRESENTIAL. *a.* (from *present*.) Supposing actual presence (*Norris*).

PRESENTIA'LITY. *s.* (from *presential*.) State of being present (*South*).

To PRESENTIATE. *v. a.* (from *present*.) To make present (*Grew*).

PRESENTIFIC. *a.* (*præsens and facio*, Latin.) Making present: not in use.

PRESENTIFICALLY. *ad.* (from *presen-*
SS

tific.) In such a manner as to make present (*More*).

PRESENTLY. *ad.* (from *present.*) 1. At present; at this time; now (*Sidney*). 2. Immediately; soon after (*South*).

PRESENTMENT. *s.* (from *present.*) 1. The act of presenting (*Shakspeare*). 2. Any thing presented or exhibited; representation (*Milton*).

PRESENTMENT, in law. See **PROSECUTION.** A presentment, generally taken, is a very comprehensive term; including not only presentments properly so called, but also inquisitions of office, and indictments by a grand jury. A presentment, properly speaking, is the notice taken by a grand jury of any offence from their own knowledge or observation, without any bill of indictment laid before them at the suit of the king: as the presentment of a nuisance, a libel, and the like; upon which the officer of the court must afterwards frame an indictment, before the party presented can be put to answer it. An inquisition of office is the act of a jury, summoned by the proper officer to inquire of matters relating to the crown, upon evidence laid before them. Some of these are in themselves convictions, and cannot afterwards be traversed or denied; and therefore the inquest, or jury, ought to hear all that can be alleged on both sides. Of this nature are all inquisitions of *felo de se*; of flight in persons accused of felony; of deodands, and the like; and presentments of petty offences in the sheriff's tourn or court leet, whereupon the presiding officer may set a fine. Other inquisitions may be afterwards traversed and examined; as particularly the coroner's inquisition of the death of a man, when it finds any one guilty of homicide; for in such cases the offender so presented must be arraigned upon this inquisition, and may dispute the truth of it; which brings it to a kind of indictment, the most usual and effectual means of prosecution. See **INDICTMENT.**

PRESENTNESS. *s.* (from *present.*) Presence of mind; quickness at emergencies (*Clarendon*).

PRESERVATION. *s.* (from *preserve.*) The act of preserving; care to preserve (*Davies*).

PRESERVATIVE. *s.* (*preservatif*, Fr.) That which has the power of preserving; something preventive (*Hooker*).

To PRESERVE. *v. a.* (*preservo*, low Lat.) 1. To save; to defend from destruction or any evil; to keep (*Clarendon*). 2. To season fruits and other vegetables with sugar, and in other proper pickles: as, to preserve plums, walnuts, and cucumbers.

PRESERVE. *s.* (from the verb.) Fruit preserved whole in sugar (*Mortimer*).

PRESERVER. *s.* (from *preserve.*) 1. One who preserves; one who keeps from ruin or mischief (*Addison*). 2. He who makes preserves of fruit.

To PRESIDE. *v. n.* (from *præsidio*, Lat. *presider*, Fr.) To be set over; to have authority over (*Dryden*).

PRESIDENCY. *s.* (*presidence*, Fr. from *president.*) Superintendence (*Ray*).

PRESIDENT. *s.* (*præsidents*, Lat.) 1. One placed with authority over others; one at the head of others (*Watts*). 2. Governour; prefect (*Brerewood*). 3. A tutelar power (*Waller*).

PRESIDENT, an officer created or elected to preside over a company, in contradistinction to the other members, who are called residents.

The lord president of the council is the fourth great officer of the crown, as ancient as king John, when he was stiled conciliarius capitalis. His office is to attend on the king, propose business at the council table, and report the transactions there to the king.

The lord president of the court of session in Scotland is the first of the fifteen lords who presides in that august assembly, which is the supreme court of justice in that kingdom.

PRESIDENTSHIP. *s.* (from *president.*) The office and place of president (*Hooker*).

PRESIDIAL. *a.* (*præsidium*, Lat.) Relating to a garrison.

To PRESS. *v. a.* (*presser*, French.) 1. To squeeze; to crush (*Milton*). 2. To distress; to crush with calamities (*Shakspeare*). 3. To constrain; to compel; to urge by necessity (*Hooker*). 4. To impose by constraint (*Dryden*). 5. To drive by violence (*Shakspeare*). 6. To affect strongly (*Acts*). 7. To enforce; to inculcate with argument or importunity (*Felton*). 8. To urge; to bear strongly on (*Boyle*). 9. To compress; to hug (*Pope*). 10. To act upon with weight (*Dryden*). 11. To make earnest (*Bacon*). 12. To force into military service (*Shakspeare*).

To PRESS. *v. n.* 1. To act with compulsive violence; to urge; to distress (*Tillotson*). 2. To go forward with violence to any object (*Knolles*). 3. To make invasion; to encroach (*Pope*). 4. To crowd; to throng (*Mark*). 5. To come unseasonably or importunately (*Dryden*). 6. To urge with vehemence and importunity (*Bacon*). 7. To act upon or influence (*Addison*). 8. To Press upon. To invade; to push against (*Pope*).

PRESS. *s.* (*pressoir*, Fr. from the verb.) 1. The instrument by which any thing is crushed or squeezed; a wine press, a cider press (*Haggar*). 2. The instrument by which books are printed (*Shakspeare*). 3. Crowd; tumult; throng (*Hooker*). 4. Violent tendency (*Shakspeare*). 5. A kind of wooden case or frame for clothes and other uses (*Shakspeare*). 6. A communication to force men into military service (*Raleigh*).

PRESS, in the mechanic arts, a machine made of iron or wood, serving to squeeze or compress any body very close. The ordinary presses consist of six members, or pieces, viz. two flat smooth planks, between which the things to be pressed are laid; two screws or worms, fastened to the lower plank, and passing through two holes in the upper; and two nuts, in form of an S, serving to drive the upper plank, which is moveable, against the lower, which is stable, and without motion.

P R E S S.

Press used by inlayers, resembles the joiner's press, except that the pieces of wood are thicker, and that only one of them is moveable; the other, which is in form of a tressel, being sustained by two legs or pillars, jointed into it at each end. This press serves them for sawing and cleaving the pieces of wood required in marquetry or inlaid work.

Press (Founder's), is a strong square frame, consisting of four pieces of wood firmly joined together with tenons, &c. This press is of various sizes, according to the sizes of the moulds; two of them are required to each mould, at the two extremes whereof they are placed; so as that, by driving wooden wedges between the mould and the sides of the presses, the two parts of the mould wherein the metal is to be run may be pressed close together.

Press (Printing). See **PRINTING-PRESS**.

Press (Rolling), is a machine used for the taking off prints from copper plates. It is much less complete than that of the letter-printers. See its description and use under the article **ROLLING-PRESS PRINTING**.

Press, in coining, is one of the machines used in striking of money, differing from the balance in that it has only one iron bar to give it motion, and press the moulds or coins: it is not charged with lead at its extremes, nor drawn by cordage. See **COINING**.

Press (Binder's cutting), is a machine used equally by bookbinders, stationers, and paste-board-makers; consisting of two large pieces of wood, in form of cheeks, connected by two strong wooden screws, which, being turned by an iron bar, draw together, or set asunder, the cheeks, as much as is necessary for the putting in the books or paper to be cut. The cheeks are placed lengthwise on a wooden stand, in the form of a chest, into which the cuttings fall. Aside of the cheeks are two pieces of wood, of the same length with the screws, serving to direct the cheeks, and prevent their opening unequally. Upon the cheeks the plough moves, to which the cutting-knife is fastened by a screw; which has its key, to dismount it on occasion to be sharpened.

The plough consists of several parts; among the rest a wooden screw or worm, which, catching within the nuts of the two feet that sustain it on the cheeks, brings the knife to the book or paper which is fastened in the press between two boards. This screw, which is pretty long, has two directories, which resemble those of the screws of the press. To make the plough slide square and even on the cheeks, so that the knife may make an equal paring, that foot of the plough where the knife is not fixed slides in a kind of groove, fastened along one of the cheeks. Lastly, the knife is a piece of steel six or seven inches long, flat, thin, and sharp, terminating at one end in a point, like that of a sword, and at the other in a square form, which serves to fasten it to the plough. See **BOOKBINDING**.

As the long knives used by us in the cutting

of books or paper are apt to jump in the cutting thick books, the Dutch are said to use circular knives with an edge all round, which not only cut more steadily, but last longer without grinding.

Press, in the woollen manufactory, is a large wooden machine, serving to press cloths, serges, ratchens, &c. thereby to render them smooth and even, and to give them a gloss. This machine consists of several members; the principal whereof are the cheeks, the nut, and the worm or screw, accompanied with its bar, which serves to turn it round, and make it descend perpendicularly on the middle of a thick wooden plank, under which the stuffs to be pressed are placed. The calender is also a kind of press, serving to press or calender linens, silks, &c.

Presses used for expressing of liquors are of various kinds; some, in most respects, the same with the common presses, excepting that the under plank is perforated with a great number of holes, to let the juice expressed run through into a tub or receiver underneath.

Plate 142, fig. 3, is a simple packing press, described by M. Buschenderf, in *Les Annales des Arts*. **ABD** is a strong frame of wood; through the upper bar **D** a strong iron rack **E**, similar to a saw, slides a small click **e**, pushed by a spring, prevents it rising after the lever **F** has pressed it down: the lower end of this rack has the bed of the press **K** fixed to it, under which the goods **G** to be pressed are put. The lever **F** has a mortise through it, to admit the rack **E**; and a click **f**, which takes into its teeth the lever, moves round a bolt **g**, as a centre, which can be put through any of the holes in the beam, according to the quantity of the goods to be pressed. The machine operates as follows: When the lever **F** is lifted up its click **f** slips over the sloping side of the teeth, and when it is pulled down the click takes hold of the teeth and draws the rack down with it another tooth: the click **e** then holds it, while the lever is raised to take another tooth as before. The only objection to this simple press is a want of power for pressing many articles, and that the teeth of the rack could not be made fine enough for a man to press down a whole tooth without resting. To remedy the first inconvenience, it has occurred to us that a bolt **h** might be put through two of the beams, and the end of a common handspike **H** put under it. This handspike might be connected with **F** by an endless chain put over both: this chain might have a hook at the end, so as to shorten or lengthen it by hooking it into another link, as occasion required. For the second inconvenience a plate of iron **i**, with teeth in it, might be fastened to the lever **F**, and a long click **I**, connected with the frame, might fall into them, so as to prevent the lever rising. By this means each tooth of the rack may be divided into four or five parts; and when the click **e** takes hold of a new tooth, the long click **I** may be lifted up, and the lever raised. As before, the click might be hooked up when the press **I** is used as above described: the chain or

handspike may be taken away and replaced in a very short time.

Fig. 4. is a screw-press, used for expressing some kinds of oil; the frame ADB is formed of one piece of cast-iron, the upper piece has a brass nut fixed in it, through which the screw E works; the screw has holes through its lower end, to put in a long iron lever F, by which the screw is turned. The substance from which the oil is to be pressed, is tied up in horse-hair bags, and laid under the bed of the press G, with a warm iron plate between each bag; the screw is then turned by men, as long as they can move it; a rope is then hooked to the end of the lever, and the power of a windlass or capstan is used to assist the lever: the oil weeps out of the bags, and runs down through a spout into the reservoir H, placed to raise it.

Fig. 5. is a representation of the hydrostatic press for which Mr. Bramah took out a patent in 1796. The frame of this is like a common press; the bed A is fastened to the piston B, of a stout brass barrel D, the lower end of which communicates by a pipe E, with a forcing pump within the cylindric vessel F; the piston *ff* of this is cut hollow, and has the connecting rod *g* jointed within side of it. The lever *b*, which works the pump, is jointed to the lower end of this rod, so that the circular motion of the lever is allowed by the connecting rod *g* moving in or out of the hollow in the piston rod; and the parallelism of the piston is preserved by a collar H.

Fig. 6. and 7. explain the construction of the pump within the cistern F; I is the barrel of brass, this has the piece J screwed into it lower, and this piece J is screwed into the end of the pipe E, and contains within it a valve opening downwards. To the part L of the barrel, the piece K containing a valve opening inwards is screwed; this is open to the water, oil, &c. contained in the cistern F, when the lever G is raised, the barrel fills with water through the valve K, and when it is pushed down, the valve K shuts, J opens, and the water is forced through the pipes E into the large barrel D, and by pushing out its piston B, presses the goods laid upon the bed A of the press. When the goods are sufficiently pressed, the lever G is pushed down, and the lower end of the piston opens the valves JK, and the detent *k* pushes towards the piston, opens the valves K, which allows the water to pass back into the reservoir, the bed of the press falls down, the valves are composed of a small brass cone, (fig. 4.) which exactly fits its seat, and is kept in its place by a wire fastened to it; this wire is cut flat on one side to allow the water to pass through when the valve is open, and a small spiral spring closes it. (*Gregory's Cyclo.*)

PRESS used by joiners, to keep close the pieces they have glued, especially pannels, &c. of wainscot is very simple, consisting of four members, viz. two screws, and two pieces of wood, four or five inches square, and two or three feet long; whereof the holes at the two ends serve for nuts to the screws.

PRESS (Liberty of the). See LIBERTY.

PRESSBED. *s.* (*press and bed.*) Bed so formed as to be shut up in a case.

PRESSER. *s.* (*from press.*) One that presses or works at press (*Swift*).

PRESSGANG. *s.* (*press and gang.*) A crew that strolls about the streets to force men into naval service.

PRESSING, in the manufactures, is the violently squeezing a cloth, stuff, &c. to render it smooth and glossy. There are two methods of pressing, viz. cold or hot. As to the former, or cold-pressing, after the stuff has been scoured, fulled, and shorn, it is folded square in equal plaits, and a skin of vellum, or pasteboard, put between each plait. Over the whole is laid a square wooden plank, and so put into the press, which is screwed down tight by means of a lever. After it has lain a sufficient time in the press, they take it out, removing the pasteboards, and lay it up to keep. Some only lay the stuff on a firm table, after plaiting and pasteboarding cover the whole with a wooden plank, and load it with a proper weight.

The method of pressing hot is this: when the stuff has received the above preparations, it is sprinkled a little with water, sometimes gum-water, then plaited equal, and between each two plaits are put leaves of pasteboard; and between every sixth or seventh plait, as well as over the whole, an iron or brass plate well heated in a kind of furnace. This done it is laid upon the press, and forcibly screwed down. Under this press are laid five, six, or more pieces, at the same time, all furnished with their pasteboards and iron-plates. When the plates are well cooled, the stuffs are taken out and stitched a little together to keep them in the plaits. This manner of pressing, however, was only invented to cover the defects of stuffs; and accordingly it has been frequently prohibited.

PRESSINGLY. *ad.* (*from pressing.*) With force; closely (*Howell*).

PRESSION. *s.* (*from press.*) The act of pressing (*Newton*).

PRESSITANT. *a.* Gravitating; heavy (*More*).

PRESSMAN. *s.* (*press and man.*) 1. One who forces another into service; one who forces away (*Chapman*). 2. One who makes the impression of print by the press: distinct from the compositor, who ranges the types.

PRESSMONEY. *s.* (*press and money.*) Money given to a soldier when he is taken or forced into the service (*Gay*).

PRESSURE. *s.* (*from press.*) 1. The act of pressing or crushing. 2. The state of being pressed or crushed. 3. Force acting against any thing; gravitation; weight acting or resisting (*Newton*). 4. Violence inflicted; oppression (*Bacon*). 5. Affliction; grievance; distress (*Atterbury*). 6. Impression; stamp; character made by impression (*Shakspeare*).

PRESSURE, is properly the action of a body which makes a continual effort or endeavour to move another; such as the action of a heavy body supported by a horizontal table; in contradistinction from percussion, or a momentary

force or action. Pressure equally respects both bodies, that which presses, and that which is pressed; from the mutual equality of action and reaction.

For remarks on the difference between pressure and percussion, see our articles IMPULSION and PERCUSSION.

PRESSURE OF FLUIDS. See HYDROSTATICS and PNEUMATICS.

PRESSURE (Centre of). See PRESSURE.

PREST. *a.* (*prest*, or *prêt*, Fr.) Obsolete.
1. Ready; not dilatory (*Fairfax*). 2. Neat; tight (*Tusser*).

PREST. *s.* (*prest*, Fr.) A loan (*Bacon*).

PRESTATION-MONEY, is a sum of money paid yearly by archdeacons and other dignitaries to their bishop, *pro exteriori jurisdictione*.

PRESTATION (*prestatio*), was anciently used for other payments: *Et quieti sint de prestatione muragii*. Chart. Hen. VII. Sometimes also for pourveyance.

PRESTEIGN is a town of Radnorshire, distant 149 miles W.N.W. from London, in the direct road to Aberystwith, and throughout South Wales, in N. lat. 52° 12', bounded to the north and north-east by Herefordshire. It is a neat well-built town, with clean and regular streets, and is the residence of many genteel families. The neighbourhood abounds with all the comforts and conveniences of life. It is seated on a gravelly soil on the banks of the river Lug, and at the head of a very fertile vale; the mountains to the west and north-west of the town forming, as it were, an amphitheatre round it. The name of it in Welsh is *Slan-Andras*, which is supposed to be derived from the church, which is dedicated to Saint Andrew. The town is divided into four wards, which have each a separate jurisdiction, separate officers, levies, &c. The curfew-bell of William the Conqueror still remains in this place, and is rung every night. It is a borough by prescription, and is governed by a bailiff annually elected, and sworn in by a steward appointed by the crown.

PRESTER (JOHN or JEAN), an appellation formerly given to an emperor of the Tartars, who was overcome and killed by Jenghiz Khan. Since that time it has been given to the emperor of Abyssinia or Ethiopia: however, in Ethiopia itself this name is utterly unknown, the emperor being there called the grand negus.

PRESTER, a meteor, consisting of an exhalation thrown from the clouds downwards with such violence, as that by the collision it is set on fire. The word is Greek, *πρεστηρ*, the name of a kind of serpent; called also *dipsas*, to which this meteor is supposed to bear a resemblance. The prester differs from the thunderbolt in the manner of its inflammation; and in its burning and breaking every thing it touches with greater violence. The exhalation, however, is usually supposed to be electric; and the meteor to be of the nature of the water-spout. See LUCRETIVS, vi. 23, and Good's note upon the passage.

PRESTER, a word used by some to express

the external part of the neck, which is usually inflated in anger.

PRESTIGATION. *s.* (*præstigatio*, Latin.) A deceiving; a juggling; a playing legerdemain.

PRESTIGES. *s.* (*præstigia*, Lat.) Illusions; impostures; juggling tricks.

PRETISSIMO. (Ital.) In music, the superlative of *presto*. A word denoting the most rapid time.

PRESTO. (Ital.) A word implying that the movement at the beginning of which it is placed is to be performed in a very quick, though not the quickest, time.

PRESTON, a town of England, in the county of Lancaster. This is a large and handsome town, situated on the Ribble, which is navigable for small vessels. Near this town the Scotch were routed, under the command of the duke of Hamilton, who came to assist Charles I.; and in the year 1715, the rebels were defeated by the troops of George I. Here are three markets weekly, Wednesday, Friday, and Saturday. Every twentieth year, a guild or jubilee is held here, which begins the latter end of August, and continues a month. Preston sends two members to the British parliament: 21 miles S. Lancaster, and 214 N.N.W. London. Lon. 2. 53 W. Lat. 53. 46 N.

PRESTON PANS, a village in Haddingtonshire, noted for its saltworks, and for the defeat of the royal army by the rebels, in 1745. It is four miles W. of Haddington.

PRESUMABLY. *ad.* (from *presume*.) Without examination (*Brown*).

To PRESUME. *v. n.* (*presumer*, French; *presumo*, Latin.) 1. To suppose; to believe previously without examination (*Milton*). 2. To suppose; to affirm without immediate proof (*Brown*). 3. To venture without positive leave (*Milton*). 4. To form confident or arrogant opinions (*Locke*). 5. To make confident or arrogant attempts (*Hooker*).

PRESUMER. *s.* (from *presume*.) One that presupposes; an arrogant person (*Wotton*).

PRESUMPTION. *s.* (*præsumptus*, Lat. *presumption*, Fr.) 1. Supposition previously formed (*K. Charles*). 2. Confidence grounded on any thing presupposed (*Clarendon*). 3. An argument strong, but not demonstrative; a strong probability (*Hooker*). 4. Arrogance; confidence blind and adventurous; presumptuousness (*Dryden*). 5. Unreasonable confidence of divine favour (*Rogers*).

PRESUMPTIVE. *a.* (*presumptif*, French.) 1. Taken by previous supposition (*Locke*). 2. Supposed: as, the presumptive heir: opposed to the heir apparent. 3. Confident; arrogant; presumptuous (*Brown*).

PRESUMPTUOUS. *a.* (*presumptueux*, French.) 1. Arrogant; confident; insolent (*Shakspeare*). 2. Irreverent with respect to holy things (*Milton*).

PRESUMPTUOUSLY. *ad.* 1. Arrogantly; confidently. 2. Irreverently (*Addison*). 3. With vain and groundless confidence in divine favour (*Hammond*).

PRESUMPTUOUSNESS. *s.* (from *pre-*

sumptuous.) Quality of being presumptuous; confidence; irreverence.

PRESUPPOSAL. *s.* (*pre* and *supposal.*) Supposal previously formed (*Hooker*).

To PRESUPPOSE. *v. a.* (*presupposer*, French; *pre* and *suppose.*) To suppose as previous; to imply as antecedent (*Hooker*).

PRESUPPOSITION. *s.* (*presupposition*, Fr.) Supposition previously formed.

PRESURMISE. *s.* (*pre* and *surmise.*) Surmise previously formed (*Shakspeare*).

PRETENCE. *s.* (*prætensus*, Latin.) 1. A false argument grounded upon fictitious postulates (*Tillotson*). 2. The act of showing or alleging what is not real; show; appearance (*Wake*). 3. Assumption; claim to notice (*Evelyn*). 4. Claim true or false (*Milton*). 5. Something threatened, or held out to terrify (*Shakspeare*).

To PRETEND. *v. a.* (*prætendo*, Latin.) 1. To hold out; to stretch forward (*Dryden*). 2. To simulate; to make false appearances or representations; to allege falsely (*Milton*). 3. To show hypocritically (*Decay of Piety*). 4. To hold out a delusive appearance (*Milton*). 5. To claim (*Dryden*).

To PRETEND. *v. n.* 1. To put in a claim truly or falsely (*Dryden*). 2. To presume on ability to do any thing; to profess presumptuously (*Brown*).

PRETENDER. *s.* (from *pretend.*) One who lays claim to any thing (*Pope*).

PRETENDINGLY. *ad.* (from *pretending.*) Arrogantly; presumptuously (*Collier*).

PRETENSION. *s.* (*prætensio*, Latin.) 1. Claim true or false (*Swift*). 2. Fictitious appearance (*Bacon*).

PRETER. *s.* (*præter*, Latin.) A particle which, prefixed to words of Latin original, signifies *beside*.

PRETERIMPERFECT. *a.* In grammar, denotes the tense not perfectly past.

PRETERITE. *a.* (*preterite*, French; *præteritus*, Latin.) Past. See **GRAMMAR**.

PRETERITION. *s.* (*preterition*, French; from *preterite.*) The act of going past; the state of being past.

PRETERITION, or PRETERMISSION, in rhetoric, a figure whereby, in pretending to pass over a thing untouched, we make a summary mention thereof. "I will not say he is valiant, he is learned, he is just," &c. The most artful praises are those given by way of preterition.

PRETERITNESS. *s.* (from *preterit.*) State of being past; not presence; not futurity.

PRETERLAPSED. *a.* (*præterlapsus*, Lat.) Past and gone (*Walker*).

PRETERLEGAL. *a.* (*preter* and *legal.*) Not agreeable to law (*King Charles*).

PRETERMISSION. *s.* (*pretermission*, Fr.) The act of omitting.

To PRETERMIT. *v. a.* (*prætermitto*, Lat.) To pass by (*Bacon*).

PRETERNATURAL. *a.* (*preter* and *natural.*) Different from what is natural; irregular.

PRETERNATURALLY. *ad.* In a manner different from the order of nature (*Bacon*).

PRETERNATURALNESS. *s.* (from *preternatural.*) Manner different from the order of nature.

PRETERPERFECT. *a.* (*præteritum perfectum*, Latin.) A grammatical term applied to the tense which denotes time absolutely past (*Addison*).

PRETERPLUPERFECT. *a.* (*præteritum plusquam perfectum*, Latin.) The grammatical epithet for the tense denoting time relatively past, or past before some other past time.

PRETEXT. *s.* (*pretextus*, Lat.) Pretence; false appearance; false allegation (*Daniel*).

PRETEXTA (Toga), among the ancient Romans, a long white gown, with a border of purple round the edges, and worn by children of quality till the age of puberty, viz. by the boys till 17, when they changed it for the toga virilis; and by the girls till marriage.

PRETIUM SEPULCHRI, in old law books, &c. those goods accruing to the church wherein a corpse is buried. In the Irish canons, lib. xix. cap. 6. it is ordered, that along with every body that is buried, there go his cow, horse, apparel, and the furniture of his bed; none of which may be disposed of otherwise than for the payment of debts, &c. as being familiars and domestics of the deceased.

PRETOR, a magistrate among the ancient Romans, not unlike our lord chief justices, or lord chancellor, or both in one; as being vested with the power of distributing justice among the citizens. At first there was only one pretor; but afterwards, another being created, the first or chief one had the title of *prætor urbanus*, or the city pretor: the other was called *peregrinus*, as being judge in all matters relating to foreigners. But, besides these, there were afterwards created many provincial pretors; who were not only judges, but also assisted the consuls in the government of the provinces, and even were invested with the government of provinces themselves.

PRETORIAN GUARD, in Roman antiquity, were the emperor's guards, who at length were increased to 10,000 men: they had this denomination, according to some, from their being stationed at a place called *Prætorium*; their commander was styled *præfectus prætorii*.

PRETORIUM, or PRÆTORIUM, among the Romans, denoted the hall or court wherein the pretor lived, and wherein he administered justice. It likewise denoted the tent of the Roman general, wherein councils of war, &c. were held: also a place in Rome where the Pretorian guards were lodged.

PRETTILY. *ad.* (from *pretty.*) Neatly; elegantly; pleasingly without dignity or elevation (*Bacon*).

PRETTINESS. *s.* (from *pretty.*) Beauty without dignity; neat elegance without elevation (*More*).

PRETTY. *a.* (*pnæz*, finery, Saxon; *pretto*, Italian; *prat*, *prattigh*, Dutch; *pretium*, Lat.) 1. Neat; elegant; pleasing without surprise or elevation (*Watts*). 2. Beautiful without grandeur or dignity (*Spectator*). 3. It is used

in a kind of diminutive contempt in poetry, and in conversation: as, *a pretty fellow indeed!* (Addison). 4. Not very small. A vulgar use (Abbot).

PRE'TTY. *ad.* In some degree: it is less than very; *the words are pretty good*; that is, not very good (Addison. Baker).

To PREVAIL. *v. n.* (*prevailoir*, French.) 1. To be in force; to have effect; to have power; to have influence (Locke). 2. To overcome; to gain the superiority (Shakspeare). 3. To gain influence; to operate effectually (Wilkins). 4. To persuade or induce (Clarendon).

PREVAILING. *a.* (from *prevail*.) Predominant; having much influence (Rowe).

PREVAILMENT. *s.* (from *prevail*.) Prevalence (Shakspeare).

PREVALENCE. **PRE'VALENCY.** *s.* (*prevalence*, Fr. *prævalentia*, low Latin.) Superiority; influence; predominance; efficacy; force; validity (Clarendon).

PREVALENT. *a.* (*prævalens*, Latin.) 1. Victorious; gaining superiority (South). 2. Powerful; efficacious (Milton). 3. Predominant (Woodward).

PREVALENTLY. *ad.* (from *prevalent*.) Powerfully; forcibly (Prior).

To PREVARIATE. *v. n.* (*prævaricor*, Lat.) To cavil; to quibble; to shuffle (Stillingfleet).

PREVARICATION. *s.* (*prævaricatio*, Lat.) Shuffle; cavil (Addison).

PREVARICATOR. *s.* (*prævaricator*, Lat.) A caviller; a shuffler.

To PREVENIE. *v. a.* (*prævenio*, Lat.) To hinder (Philips).

PREVENIENT. *a.* (*præveniens*, Lat.) Preceding; going before; preventive (Milton).

To PREVENT. *v. a.* (*prævenio*, Lat. *prevenir*, Fr.) 1. To go before as a guide; to go before, making the way easy (Common Prayer). 2. To go before; to be before (Bacon). 3. To anticipate (Pope). 4. To preoccupy; to preengage; to attempt first (King Charles). 5. To hinder; to obviate; to obstruct (Atterbury).

To PREVE'NT. *v. a.* To come before the time. A latinism (Bacon).

PREVENTATIVE. See **PREVENTIVE** and **PROPHYLACTIC**.

PREVENTER. *s.* (from *prevent*.) 1. One that goes before (Bacon). 2. One that hinders; a hinderer; an obstructor.

PREVENTION. *s.* (*prevention*, French; from *præventum*, Latin.) 1. The act of going before (Milton). 2. Preoccupation; anticipation (Shakspeare). 3. Hinderance; obstruction (Milton). 4. Prejudice; prepossession (Dryden).

PREVENTIONAL. *a.* (from *prevention*.) Tending to prevention.

PREVENTIVE. *a.* (from *prevent*.) 1. Tending to hinder (Bacon). 2. Preservative; hindering ill (Brown).

PREVENTIVE. *s.* (from *prevent*.) A preservative; that which prevents; an antidote.

PREVENTIVELY. *ad.* In such a manner as tends to prevention (Brown).

PREVESA, a seaport of Turkey in Europe, in Albania, with a bishop's see. It stands on the ruins of the ancient Nicopolis, built by emperor Augustus, in memory of his victory over Antony. It belongs to the Venetians, and was taken by them in 1684. It is seated on a mountain, on the gulph of Larta, 70 miles N.W. of Lepanto. Lon. 21. 5 E. Lat. 39½ 14 N.

PREUILLY, a town of France, in the department of Indre and Loire. Near it are mines of iron; and to the S.W. is La Haye, a small town on the Creuse, famous as the birthplace of Descartes. Preuilly is seated on the Claise, 18 miles S. of Loches.

PREVIOUS. *a.* (*prævius*, Latin.) Antecedent; going before; prior (Burnet).

PREVIOUSLY. *ad.* Beforehand; antecedently (Prior).

PREVIOUSNESS. *s.* (from *previous*.) Antecedence.

PREY. *s.* (*præda*, Latin.) 1. Something to be devoured; something to be seized; ravin; plunder (Clarendon). 2. Ravage; depredation (Shakspeare). 3. Animal of prey, is an animal that lives on other animals (L'Estrange).

To PREY. *v. n.* (*prædor*, Latin.) 1. To feed by violence (Shakspeare). 2. To plunder; to rob (Shakspeare). 3. To corrode; to waste (Addison).

PREYER. *s.* (from *prey*.) Robber; devourer; plunderer.

PRIAMIDES, a patronymic applied to Paris and all the other children of Priam.

PRIAMUS, **PRIAM**, the last king of Troy, was son of Laomedon. When Hercules took the city of Troy, (see **LAOMEDON**) Priam was in the number of his prisoners, but his sister Hesione redeemed him from captivity, and he exchanged his original name, which was Podarces, for that of Priam, which signifies bought or ransomed. Being placed on his father's throne by Hercules, he employed himself with uncommon diligence in fortifying and embellishing the city of Troy. He now divorced Arisba for Hecuba, the daughter of Cisseus. He had by Hecuba 17 children, according to Homer, 19; the most celebrated of whom are Hector, Paris, Deiphobus, Helenus, Pammon, Polites, Antiphus, Hipponous, Troilus, Creusa, Laodice, Polyxena, and Cassandra. Besides these he had many others by concubines. After he had reigned for some time, Priam expressed a desire to recover his sister Hesione, whom Hercules had carried into Greece, and married to Telamon his friend. He manned a fleet of which he gave the command to his son Paris, with orders to bring back Hesione. Paris neglected his father's injunctions, and carried away Helen, the wife of Menelaus, king of Sparta, during the absence of her husband. Priam countenanced his son, by receiving in his palace the wife of the king of Sparta. This rape kindled the flames of the Trojan war. Troy, after a ten years' siege, having been betrayed

into the hands of the Greeks, and Hector, the chief support of the Trojans, slain by Achilles, Priam resolved to die in defence of his country. He put on his armour, and advanced to meet the Greeks, but was detained by the tears and entreaties of his wife at the altar of Jupiter, to which Polites, one of his sons, fled, in the mean time, from the fury of Neoptolemus, who pursued him. The son, wounded and overcome, fell dead at the feet of his parents. The aged father raised his spear, which he darted at Neoptolemus; it only touched his buckler, and fell to the ground. Neoptolemus seized the grey hair of Priam, and plunged his dagger into his breast. His head was cut off, and the mutilated body was left among the heaps of slain.

PRIAPEIA. See **NICOTIANA MINOR**.

PRIAPISM. (*priapismus*, *πριαπισμος*, from *πριαπος*, a heathen god, whose penis is always painted erect.) A continual erection of the penis.

PRIAPUS, a deity among the ancients, who presided over gardens, and the parts of generation in the sexes. He was son of Venus by Bacchus. Priapus was so deformed, that his mother, ashamed to give birth to such a monster, ordered him to be exposed on the mountains. His life, however, was preserved by

shepherds, and he received the name of Priapus, *propter deformitatem & membri virilis magnitudinem*. Festivals were also celebrated in honour of him by the people of Lampsacus, and they gave themselves up to every lasciviousness and impurity during the celebration. His worship was also introduced in Rome; but the Romans revered him more as a god of orchards and gardens, than as the patron of licentiousness. He is generally represented with an human face, and the ears of a goat; he holds a stick in his hand, with which he terrifies birds, as also a club to drive away thieves, and a scythe to prune the trees and cut down the corn.—2. A town of Asia Minor, near Lampsacus. Priapus was the deity of the place, and from him the town received its name, because he had taken refuge there when banished from Lampsacus.

PRIBODA, a town of Sweden, in the province of Smaland, 16 miles S.S.W. of Carlscrona. Lon. 15. 18 E. Lat. 56. 10 N.

PRICE. *s.* (*prix*, Fr. *pretium*, Lat.) 1. Equivalent paid for any thing (*Bacon*). 2. Value; estimation; supposed excellence (*Bacon*). 3. Rate at which any thing is sold (*Locke*). 4. Reward; thing purchased by merit (*Pope*).

To PRICE. v. a. To pay for (*Spenser*),

A TABLE exhibiting the PRICES of various NECESSARIES of LIFE, together with that of Day Labour, in Sterling Money, and also in Decimals, at different Periods from the Conquest to the Year 1800, derived from respectable Authorities; with the Depreciation of the Value of Money inferred therefrom. To which is added, the mean Appraisal of Money, according to a Series of Intervals of 50 Years; and, during the present Century, at shorter Periods, deduced by Interpolation. By Sir George Shuckburgh Evelyn, Bart. F. R. S. and A. S. (From the Philosophical Transactions.)

THE PRICES OF VARIOUS ARTICLES AT DIFFERENT TIMES (in Money reduced to the present Standard and Value.)																					
MISCELLANEOUS ARTICLES.															Depreciation of Money, according to the Price of					Mean Appreciation by Interpolation.	
Year of our Lord.	Wheat per Bushel.	Cattle in Husbandry.					Poultry.			Butter per lb.	Cheese per lb.	Ale per Gallon.	Small Beer per Gallon.	Mean Depreciation from these 13 Articles.	Beef and Mutton per lb.	Labour in husbandry per day.	Depreciation of Money, according to the Price of			A. D.	
		Horse.	Ox.	Cow.	Sheep.	Hog.	Goose.	Hen.	Cock.								Wheat	Twelve miscell. Linen & Articles.	Meat.		Day Labour
1050	0 24 480	0 7 6 20	0 6 0 37	0 1 3 29	0 2 0 26									42			10	42	26	1050	
1150	0 42 5	0 12 5 48		0 1 8 0	0 3 0		0 3													1100	
1250	1 7 3	1 11 0	0 17 0 1	0 1 7		1 0 4	0 3	0 4 1												1200	
1350	1 10 1/2	1 4 6 66	0 17 2 0	0 2 7	0 2 6	0 9 75	0 2 34	0 2 31						56		0 3	100	56	77	1300	
1450	1 5	1 15 8	0 15 6 0	0 4 1 1/2	0 5 1	0 6 4										0 3 1/2				1400	
1550	1 10 1/2	1 16 7 100	0 16 0 100	0 4 3 1/2	0 5 6	1 0 100	0 8 1 100	1 0 100	5 100	2 100	0 1 1/2 100	1 100	1 0 1/2	100		0 4	100	100	100	1500	
1600	4 0 1/2										0 4	2	1 2	0 6						1600	
1625	4 11					2 0		1 6								0 6 1/2				1625	
1650	5 6										0 4	2								1650	
1675	4 6	3 6 0 184	2 17 0 345	0 11 0 26	0 14 0 24	3 0 300	1 3 162	1 3 125	4 1/2 50	2 100	0 8 520	2 1/2 250	1 3 1/2	0 7 1/2	246	239	166	188	210	1675	
1700	4 9 1/2										0 10	3		2 9						1700	
1720	4 4 1/2										1 0	3	2 2	0 8		0 8				1720	
1740	3 8	8 0 0 437	7 7 0 744	1 6 0 492	1 13 0 634	3 6 350	1 6 213	1 6 150	9 180	3 1/2 175	1 0 800	3 300	3 0	0 10	197	434	266	250	287	1740	
1760	3 9 3/4	8 10 0 477	7 0 0 874	1 7 0 636	1 15 0 634	5 0 500	1 10 256	1 10 183	10 200	5 1/2 502	1 1/2 970	3 100	4 2	0 11	203	492	400	275	344	1760	
1780	4 5 1/2	19 0 0 504	16 8 0 2000	1 18 0 822	5 8 0 1560	3 0 350	1 6 218	1 6 150	11 1/2 230	5 750	1 2 1/2 960	2 3/4 275	5 3	1 5 1/4	426	752	511	456	501	1780	
1795	7 10													752						502	1795
																				neary	

* The smaller figures denote the price in decimals, whereof those for the year 1550 may be taken for the integer, viz. 100.

PRICE (Rev. Richard), D.D. LL.D. fellow of the royal society of London, and of the academy of sciences, New England, was born at Tynton in Glamorganshire, February 22, 1723. His father was a dissenting minister at Bridgend in that county, and died in 1739. At eight years old he was placed under a Mr. Simmons of Neath; and in four years removed to Pentwyn in Caermarthenshire under the Rev. Samuel Jones, whom he represented as a man of a very enlarged mind, and who first inspired him with liberal sentiments of religion. Having lived as long with him as with Mr. Simmons, he was sent to Mr. Griffith's academy at Talgarth in Breconshire. In 1740 he lost his mother; and on this he quitted the academy and came to London. Here he was settled at that academy of which Mr. Eames was the principal tutor, under the patronage of his uncle the Rev. S. Price, who was co-pastor with Dr. Watts upwards of 40 years. At the end of four years he left this academy, and resided with Mr. Streatfield of Stoke Newington in the quality of domestic chaplain, while at the same time he regularly assisted Dr. Chandler at the Old Jewry, and occasionally assisted others. Having lived with Mr. Streatfield near 13 years, on his death and his uncle's he was induced to change his situation, and in 1757 married Miss S. Blundell of Leicestershire. He then settled at Hackney; but being shortly after chosen minister at Newington Green, he lived there until the death of his wife, which was in 1786, when he returned to Hackney. He was next chosen afternoon-preacher at the meeting-house in Poor Jewry-street; but this he resigned on being elected pastor of the Gravel-pit meeting, Hackney, and afternoon-preacher at Newington Green. These he resigned with a farewell-sermon in February 1791. Shortly after he was attacked with a nervous fever; which disappearing was succeeded by a disorder in his bladder, which reduced him to such a degree that, worn out with agony and disease, he died without a groan on the 19th of April, 1791. He left his property to a sister and two nephews.

Dr. Kippis, speaking of his learning and pursuits, observes, that "his chief aim was to lay a foundation for solid knowledge, by an application to sciences of the noblest kind. It was on the great and fundamental principles and obligations of morality, on the higher species of mathematics, on the sublimer parts of natural philosophy, on the true basis of government, and on the questions which relate to the essential welfare and dignity of man, that his studies were employed; and in the prosecution of these studies he not only enriched his own mind, but was enabled to become of eminent service to his country and to the world. In his moral writings he has laboured with distinguished ability to build the science of ethics on an immutable basis; and what he has advanced will always stand high in estimation, as one of the strongest efforts of human reason in favour of the system he has adopted. For myself (adds Dr. Kippis), I

scruple not to say, that I regard the treatise referred to as a rich treasure of valuable information, and as deserving to be ranked among the first productions of its kind. With respect to his other ethical works, every one must admire the zeal, earnestness, and strength, with which he endeavours to lead men into pious views of God, of providence and prayer; and to promote the exercise of devout and amiable dispositions. In consequence of his profound knowledge in mathematical calculations, he was qualified at a particular crisis for being of singular utility to his fellow-citizens. A number of schemes for insurance for lives, and the benefit of survivorship, promising mighty advantages, were rising up in the metropolis. These ruinous schemes would have been carried to great excess, had not Dr. Price stepped forward and dispelled the delusion. Gratitude will not allow us to forget the ability and spirit with which he awakened the attention of his countrymen to the reduction of the national debt. With him it was that the scheme of the late Mr. Pitt for that purpose originated. What crowned the whole of his character was, its being an assemblage of the most amiable and excellent private virtues. His piety was sincere, humble, and fervent; his soul pure and elevated. In his views disinterested and noble, and in his manners mild and gentle, the applause of his talents and virtues will be transmitted to future ages, and he will be united in the catalogue with the most eminent benefactors of mankind."

This is the panegyric of a friend; but with few abatements it will be admitted, we apprehend, by most of our readers.

The works of Dr. Price were, *A Review of the principal Questions and Difficulties in Morals*, 8vo. 1758; *Dissertations on Providence*, &c. 8vo. 1767; *Observations on Reversionary Payments*, &c. 8vo. 1771; *Appeal on the National Debt*, &c. 8vo. 1773; *Observations on the Nature of Civil Liberty*, 1776; on *Materialism and Necessity*, in a *Correspondence between Dr. Price and Dr. Priestley*, 1779; on *Annuities, Assurances, Population*, &c. 8vo. 1779; on the *Population of England*, 1780; on the *Public Debts, Finances, Loans*, &c. 8vo. 1783; on *Reversionary Payments*, 2 vols. 1783; on the *Importance of the American Revolution*, 1784: besides *Sermons*, and a variety of papers in the *Philosophical Transactions* on astronomical and other philosophical subjects.

To PRICK. *v. a.* (priecken, Saxon.) 1. To pierce with a small puncture (*Arbutnot*). 2. To form or erect with an acuminate point (*Bacon*). 3. To fix by the point (*Newton*). 4. To hang on a point (*Sundys*). 5. To nominate by a puncture or mark (*Shakspeare*). 6. To spur; to goad; to impel; to incite (*Sh.*). 7. To pain; to pierce with remorse (*Acts*). 8. To make acid (*Hudibras*). 9. To mark a tune.

To PRICK. *v. n.* (*prijken*, Dutch.) 1. To dress one's self for show. 2. To come upon the spur (*Spenser*).

PRICK. *s.* (*pricca*, Saxon.) 1. A sharp slender instrument; any thing by which a puncture is made (*Davies*). 2. A thorn in the mind; a teasing and tormenting thought; remorse of conscience (*Shakspeare*). 3. A spot or mark at which archers aim (*Carew*). 4. A point; a fixed place (*Shakspeare*). 5. A puncture (*Brown*). 6. The print of a hare in the ground.

PRICKER. *s.* (from *prick*.) 1. A sharp-pointed instrument (*Moxon*). 2. A light horseman; not used (*Hayward*).

PRICKET. *s.* (from *prick*.) A buck in his second year (*Manwood*).

PRICKING, in farriery, a very common accident which happens to the horse in shoeing. (See **PUNCTURE**.) It takes place either in consequence of the farrier's rashness in entering the nail too close to the sensible parts, or of the accidental bending of the nail in an unfavourable direction afterwards. When this happens the horse soon becomes lame; and it will be necessary, in the first instance, to draw the nail which has occasioned the mischief, and, secondly, to apply such remedies as are likely to abate inflammation in the foot. Instead of this, however, it is too common to treat the part with stimulating oils and tinctures.

PRICKLE. *Aculeus.* In botany, a sharp process from a plant, fixed into the bark only: as in rose, bramble, gooseberry, and barberry. This and the thorn are called *arma* by Linneus, and are enumerated among the fulcres.

Prickles are straight—bent in, incurvate; or bent back, recurvate.—When divided, they take the name of *furcæ*, forks or forked prickles; and are called *bifid*, *trifid*, &c. from the number of divisions.

PRICKLINESS. *s.* (from *prickly*.) Fulness of sharp points.

PRICKLOUSE. *s.* (*prick* and *louse*.) A word of contempt for a tailor (*L'Estrange*).

PRICKLY. *a.* (from *prick*.) Full of sharp points (*Bacon*).

PRICKLY PEAR, in botany. See **CACTUS**.

PRICKPUNCH. *s.* A piece of tempered steel, with a round point at one end, to prick a round mark in cold iron (*Moxon*).

PRICKSONG. *s.* (*prick* and *song*.) Song set to music (*Shakspeare*).

PRICKWOOD, in botany. See **EVENY-MUS**.

PRIDE. *s.* (*priz*, or *prýð*, Saxon.) 1. Inordinate and unreasonable self-esteem (*Milt.*). 2. Insolence; rude treatment of others; insolent exultation (*Milton*). 3. Dignity of manner; loftiness of air. 4. Generous elation of heart (*Smith*). 5. Elevation; dignity (*Sha.*). 6. Ornament; show; decoration (*Milton*). 7. Splendour; ostentation (*Dryden*). 8. The state of a female beast soliciting the male (*Shakspeare*).

Pride may be distinguished from words nearly synonymous, in the following manner.

Pride is, as above, unreasonable or inordinate

self-esteem. Arrogance implies taking much upon ourselves, and is pride attended with insolence and contempt. Vanity is accompanied with affectation, and exerts itself in catching the applause of others. By presumption is understood a blind and adventurous confidence. The proud consider themselves in their own mind; full, and self-swollen, they are taken up with their own person. The arrogant claim to themselves what they have not the least pretensions to; are ready to insult those who will not allow them what they claim, and look down on the rest of the world with contempt. The vain value themselves upon the opinion of others; greedy of esteem, they are eager to engross the attention of all mankind. The presumptuous carry their audacious hopes even to chimeras; bold to undertake, they fondly imagine they have power to do every thing.

For some very excellent remarks on the dangerous moral tendency of pride, we refer to a valuable sermon on Modern Infidelity by Robert Hall, A. M.

PRIDE, in ichthyology. See **PETROMYZON**.

To PRIDE. *v. a.* (from the noun.) To make proud; to rate himself high.

PRIDEAUX (*Humphrey*), was born at Padstow in Cornwall in 1648. He studied three years at Westminster under Dr. Busby; and was thence removed to Christ-church, Oxford. Here he published, in 1676, his *Marmora Oxoniensia ex Arundelianis, Seldenianis, alisque conflata, cum perpetuo Commentario*. This introduced him to the lord chancellor Finch, afterwards earl of Nottingham, who in 1679 presented him to the rectory of St. Clement near Oxford, and in 1681 bestowed on him a prebend of Norwich. Some years after he was engaged in a controversy with the papists at Norwich, concerning the validity of the orders of the church of England, which produced his book upon that subject. In 1688 he was installed in the archdeaconry of Suffolk; to which he was collated by Dr. Lloyd, then bishop of Norwich. In 1691, upon the death of Dr. Edward Pococke, the Hebrew professorship at Oxford, being vacant, was offered to Dr. Prideaux; but he refused it. In 1697 he published his *Life of Mahomet*, and in 1702 was installed dean of Norwich. In 1710 he was cut for the stone; which interrupted his studies for more than a year. Some time after his return to London, he proceeded with his *Connection of the History of the Old and New Testament*; which he had begun when he laid aside the design of writing the *History of Appropriations*. He died in 1724.

PRIEBUS, a town of Silesia, in the principality of Sagan, situate on the Neisse, 15 miles S.W. of Sagan. Lon. 15. 12 E. Lat. 51. 32 N.

PRIENE, a maritime town of Asia Minor, one of the twelve independent cities of Ionia. It gave birth to Bias, one of the seven wise men of Greece (*Paus.*).

PRIEF, for *proof* (*Spenser*).

PRI

PRIER. *s.* (from *pry.*) One who inquires too narrowly.

PRIEST. *s.* (*ppretz*, Saxon; *prestre*, Fr.)

1. One who officiates in sacred offices (*Milton*).
2. One of the second order in the hierarchy, above a deacon, below a bishop (*Rowe*).

PRIEST, a person set apart for the performance of sacrifice, and other offices and ceremonies of religion. Before the promulgation of the law of Moses, the first-born of every family, the fathers, the princes, and the kings were priests. Thus Cain and Abel, Noah, Abraham, Melchizedec, Job, Isaac, and Jacob, offered themselves their own sacrifices. Among the Israelites, after their exodus from Egypt, the priesthood was confined to one tribe, and it consisted of three orders, the high-priest; priests, and levites. The priesthood was made hereditary in the family of Aaron, and the first-born of the oldest branch of that family, if he had no legal blemish, was always the high-priest. This divine appointment was observed with considerable accuracy till the Jews fell under the dominion of the Romans, and had their faith corrupted by a false philosophy. Then, indeed, the high-priesthood was sometimes set up to sale; and instead of continuing for life, as it ought to have done, it seems, from some passages in the New Testament, to have been nothing more than an annual office. There is sufficient reason, however, to believe, that it was never disposed of but to some descendant of Aaron, capable of filling it, had the older branches been extinct.

It has been much disputed, whether in the Christian church there be any such officer as a priest, in the proper sense of the word. The church of Rome, which holds the propitiatory sacrifice of the mass, has of course her proper priesthood. In the church of England, the word priest is retained to denote the second order in her hierarchy, but, we believe, with very different significations, according to the different opinions entertained of the Lord's supper. Some few of her divines, of great learning, and of undoubted protestantism, maintain that the Lord's supper is a commemorative and eucharistical sacrifice. These consider all who are authorised to administer that sacrament as in the strictest sense priests. Others hold the Lord's supper to be a feast upon the one sacrifice, once offered on the cross; and these too must consider themselves as clothed with some kind of priesthood. Great numbers, however, of the English clergy, perhaps the majority, agree with the church of Scotland, in maintaining that the Lord's supper is a rite of no other moral import than the mere commemoration of the death of Christ. These cannot consider themselves as priests in the rigid sense of the word, but only as presbyters, of which the word priest is a contraction of the same import with elder. *

PRIESTCRAFT. *s.* (*priest and craft.*) Religious fraud; management of wicked priests to gain power (*Spectator*).

PRIESTESS. *s.* (from *priest.*) A woman who officiated in heathen rites (*Addison*).

PRI

PRIESTHOOD. *s.* (from *priest.*) 1. The office and character of a priest (*Whitgift*). 2. The order of men set apart for holy offices (*Dryden*). 3. The second order in the hierarchy.

PRIESTLEY (Joseph), an English philosopher and dissenting divine, born at Fieldhead, Yorkshire, 1733. He was educated at Daventry for the ministry among the orthodox dissenters, and took charge of a congregation at Needham market, Suffolk, and afterwards at Nantwich, Cheshire. He in process of time became a Socinian, and became in 1761, professor of belles lettres in Warrington academy, and after seven years' residence removed to Leeds, and two years after accepted the office of librarian to lord Shelburne. In this retreat the philosopher devoted himself to metaphysical and theological studies, and published various works; and when at last he separated from his patron he retired with an annual pension of £150 to settle at Birmingham as pastor to an unitarian congregation in 1780. While here employed in advancing philosophy, and often engaged in theological and political disputes, he became the victim of popular fury. Some of his neighbours in celebrating the anniversary of the French revolution in 1791, with extreme and highly censurable intemperance, excited a dreadful riot. The meeting houses were destroyed on this melancholy occasion, and among others, Dr. Priestley's house, library, manuscripts, and philosophical apparatus, were totally consumed; and though he recovered a compensation from the county, he quitted the place. He left England in 1794, and fixed his residence at Northumberland in Pennsylvania, where he died in 1804. His writings were very numerous, and on a great variety of topics, theological, political, polemical, philosophical. As a philosopher he will long class high. As a theologian he manifested much acumen and research; though with a most unphilosophical bias towards the notions he had imbibed. As a polemic, his reasonings were masterly, but often unfair and sophistical. As a man, his conduct in every relation was uniformly mild, conciliating, and exemplary.

His chief publications are, an examination of Dr. Reid's work on the human mind, Dr. Beattie's on truth, and Dr. Osborn's on common sense; disquisition on matter and spirit, in which he denied the soul's immateriality; experiments and observations on various kinds of air, 2 vols. 8vo. &c.; letters to bishop Newcome on the duration of Christ's ministry; history of the corruptions of Christianity, 2 vols. 8vo. a work of singular character, which brought on a controversy with Dr. Horsley; history of early opinions concerning the person of Christ, &c. He also published charts of history and biography; history of electricity; history and present state of discoveries relating to vision, light, and colours; lectures on the theory and history of language, and on the principles of oratory and criticism. His discoveries and improvements in the knowledge of chemistry were very great and important;

but he lived to see the general explosion of the doctrine of phlogiston, which he had so zealously established and defended.

PRIESTLINESS. *s.* (from *priestly*.) The appearance or manner of a priest.

PRIESTLY. *a.* (from *priest*.) Becoming a priest; sacerdotal; belonging to a priest.

PRIESTRIDDEN. *a.* (*priest* and *ridden*.) Managed or governed by priests (*Swift*).

To **PRIEVE**, for *prove* (*Spenser*).

PRIG. *s.* A pert, conceited, saucy, pragmatical little fellow (*Spectator*).

PRILL. *s.* A birt or turbot (*Ainsworth*).

PRIM. *a.* (by contraction from *primitive*.) Formal; precise; affectedly nice (*Swift*).

To **PRIM.** *v. a.* (from the adj.) To deck up precisely; to form to an affected nicety.

PRIMÆ VIÆ. The first passages. The stomach and the intestinal tube are so called, and the lacteals the secundæ viæ.

PRIMACY. *s.* (*primatie*, French.) The chief ecclesiastical station (*Clarendon*).

PRIMAGE. *s.* The freight of a ship.

PRIMAL. *a.* (*primus*, Latin.) First: not in use (*Shakspeare*).

PRIMARILY. *ad.* (from *primary*.) Originally; in the first intention; in the first place (*Brown*).

PRIMARINESS. *s.* (from *primary*.) The state of being first in act or intention (*Norris*).

PRIMARY. *a.* (*primarius*, Latin.) 1. First in intention (*Hammond*). 2. Original; first (*Raleigh*). 3. First in dignity; chief; principal (*Bentley*).

PRIMARY PLANETS, those which revolve about the sun as their principal centre. See **ASTRONOMY**.

PRIMARY TEETH. See **TEETH**.

PRIMATE, the chief ecclesiastic, an archbishop. With us, the archbishop of Canterbury is styled "primate of all England;" the archbishop of York, "primate of England."

PRIMATES, in zoology, the first order in the Linnéan class mammalia; thus ordinarily characterised. Fore-teeth cutting, upper four parallel (except in some species of bats, which have only two or none); tusks

solitary, or one on each side in each jaw; teats two, pectoral; feet two, which are hands; nails (usually) flattened; oval; food, fruits, except as to a few, which use animal food. The primates are remarkable for a nearer approach to the human form than is exhibited by the other quadrupeds. The bats, however, differ greatly from the rest. It consists of four genera, for which see **MASTIOLOGY** and **ZOOLOGY**.

PRIMATESHIP. *s.* (from *primate*.) The dignity or office of a primate.

PRIME. *s.* (*primus*, Latin.) 1. The first part of the day; the dawn; the morning (*Milton*). 2. The beginning; the early days (*Milton*). 3. The best part (*Swift*). 4. The spring of life, the height of strength, health, or beauty (*Dryden*). 5. Spring (*Waller*). 6. The height of perfection (*Woodward*). 7. The first canonical hour (*Ains*). 8. The first part; the beginning: as, the prime of the moon.

PRIME. *a.* (*primus*, Latin.) 1. Early; blooming (*Milton*). 2. Principal; first rate (*Clarendon*). 3. First; original (*Locke*). 4. Excellent (*Shakspeare*).

To **PRIME.** *v. a.* (from the noun.) 1. To put in the first powder; to put powder in the pan of a gun (*Boyle*). 2. (*primer*, French, to begin.) To lay the ground on a canvass to be painted.

PRIMES, in arithmetic, denote the first divisions into which some whole or integer is divided. As, a minute, or prime minute, the 60th part of a degree; or the first place of decimals, being the 10th parts of units; or the first division of inches in duodecimals, being the 12th parts of inches; &c.

PRIME NUMBERS, are those which can only be measured by unity, or exactly divided without a remainder, 1 being the only aliquot part: as 2, 3, 5, 7, 11, 13, 17, &c. And they are otherwise called simple, or incomposite numbers. No even number is a prime, because every even number is divisible by 2. No number that ends with 0 or 5 is a prime, the former being divisible by 10, and the latter by 5. The following table contains all the prime numbers under 1000.

A TABLE of Prime Numbers under 1000.

1, 2, 3, 5, 7, 11, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53,	
59, 61, 67, 71, 73, 79, 83, 89, 97	26
101, 103, 107, 113, 127, 131, 137, 139, 149, 151, 157,	
163, 167, 173, 179, 181, 191, 193, 197, 199	47
211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269,	
271, 277, 281, 283, 293	63
307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367,	
373, 379, 383, 389, 397	79
401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461,	
463, 467, 479, 487, 491, 499	96
503, 509, 521, 523, 527, 541, 547, 557, 563, 569, 571,	
577, 587, 593, 599	111
601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659,	
661, 673, 677, 683, 691	127
701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769,	
773, 787, 797	141
809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863,	
877, 881, 883, 887	156
907, 911, 919, 929, 937, 941, 947, 953, 967, 971, 977,	
983, 991, 997	170

All prime numbers (2 excepted) are contained in the four following forms: viz. $8x \times 1$, $8x + 3$, $8x + 5$, and $8x + 7$.

PRIME VERTICAL, is that vertical circle, or azimuth, which is perpendicular to the meridian, and passes through the east and west points of the horizon.

PRIME VERTICALS, in dialling, or **PRIME-VERTICAL DIALS**, are those that are projected on the plane of the prime vertical circle, or on a plane parallel to it. These are otherwise called direct, erect, north, or south dials.

PRIME OF THE MOON, is the new moon at her first appearance, for about three days after her change. It means also the **GOLDEN NUMBER**, which see.

PRIMELY. *ad.* (from *prime*.) 1. Originally; primarily; in the first place; in the first intention (*South*). 2. Excellently; supremely well.

PRIMENESS. *s.* (from *prime*.) 1. The state of being first. 2. Excellence.

PRIMER. *s.* 1. An office of the blessed Virgin (*Stillingfleet*). 2. A small prayer book, in which children are taught to read.

PRIMER SEASIN, in feudal law, was a feudal burden, only incident to the king's tenants *in capite*, and not to those who held of inferior or mesne lords. It was a right which the king had, when any of his tenants *in capite* died seized of a knight's fee, to receive of the heir (provided he were of the full age), one whole year's profits of the lands if they were in immediate possession, and half a year's profits if the lands were in reversion expectant on an estate for life.

PRIMEROSE (Gilbert), a Scotch divine, minister of the French church in London, chaplain to James I. and canon of Windsor. He died 1642. He is author of Jacob's vow in opposition to the vows of monks and friars, in French, 4 vols. 4to.—the trumpet of Sion in 18 sermons, and other theological works. His son James, a physician, for some time practised at Paris, and settled in Yorkshire. He wrote several treatises *dè mulierum morbis*, 4to.—*dè circulatione sanguinis*—*ars pharmaceutica*—*dè vulgi erroribus in medicinâ*, 8vo. &c.

PRIMEVAL. **PRIMEVOUS**. *a.* (*primævus*, Lat.) Original; such as was at first (*Blackmore*).

PRIMING, in gunnery, the train of powder that is laid, from the opening of the vent, along the gutter or channel on the upper part of the breech of the gun; which, when fired, conveys the flame to the vent, by which it is further communicated to the charge, in order to fire the piece. This operation is only used on shipboard at the proof, and sometimes in garrison; for, on all other occasions, tubes are used for that purpose.

PRIMING-WIRE, in gunnery, a sort of iron needle employed to penetrate the vent or touch-hole of a piece of ordnance, when it is loaded; in order to discover whether the powder contained therein is thoroughly dry and fit for immediate service; as likewise to search the vent

and penetrate the cartridge, when the guns are not loaded with the loose powder.

PRIMING, among painters, signifies the laying on of the first coat of colour.

PRIMITIAL. *a.* (*primitius*, *primitiæ*, Latin.) Being of the first production (*Ains*).

PRIMITIVE. *a.* (*primitif*, French; *primitivus*, Latin.) 1. Ancient; original; established from the beginning (*Tillotson*). 2. Formal; affectedly solemn; imitating the supposed gravity of old times. 3. Original; primary; not derivative (*Milton*).

PRIMITIVE, in grammar, is a root or original word in a language, in contradistinction to derivative: thus, God is a primitive; godly, a derivative; and godlike, a compound.

PRIMITIVELY. *ad.* (from *primitive*.) 1. Originally; at first (*Brown*). 2. Primarily; not derivatively. 3. According to the original rule (*South*).

PRIMITIVENESS. *s.* (from *primitive*.) State of being original; antiquity; conformity to antiquity.

PRIMNESS. *s.* (from *prim*.) Affected niceness or formality.

PRIMOGENIAL. *a.* (*primigenius*, Lat.) First-born; original; primary; constituent; elemental (*Boyle*).

PRIMOGENITURE. *s.* (*primogeniture*, French.) Seniority; eldership; state or privilege of being first-born (*Gov. of the Tongue*).

PRIMOGENITURE, the right of the first-born, has among most nations been very considerable. The first-born son in the patriarchal ages had a superiority over his brethren, and, in the absence of his father, was priest to the family. Among the Jews, he was consecrated to the Lord, had a double portion of the inheritance, and succeeded in the government of the family or kingdom. It is, however, remarkable, and unquestionably shows the connection between this institution and the birth and office of our Saviour, that, if a woman's first child was a girl, neither she nor the children that came after her were consecrated.

In every nation of Europe, the right of primogeniture prevails in some degree at present, but it did not prevail always. The law which calls the elder-born to the crown, preferably to others, was not introduced into France till very late; it was unknown to the first race of kings, and even to the second. The four sons of Clovis shared the kingdom equally among themselves; and Louis le Debonnaire did the same: it was not till the race of Hugh Capet that the prerogative of succession to the crown was appropriated to the first-born.

By the ancient custom of Gavel-kind, still preserved in some parts of our island, primogeniture is of no account; the paternal estate being equally shared by all the sons.

PRIMORDIAL. *a.* (*primordium*, Latin.) Original; existing from the beginning (*Boy*).

PRIMORDIAL. *s.* (from the adj.) Origin; first principle (*More*).

PRIMORDIAN. *s.* A kind of plum.

PRIMORDIATE. *a.* (from *primordium*, Lat.) Original; existing from the first (*Boyle*).

Pultenaea Daphnoides.
or
Daphne-Pultenaea.



Primula Nivea.
or
Snowy Primrose.



PRIMROSE. See PRIMULA.

PRIMROSE (Nightly or tree). See CENOTHERA.

PRIMROSE (Peerless). See NARCISSUS.

PRIMULA. Primrose. In botany, a genus of the class pentandria, order monogynia. Capsule one-celled, with a ten-cleft mouth; corol with a cylindrical tube and pervious throat; stigma a globular head. Nineteen species; natives of Europe, four of them of our own country. The following are cultivated.

1. *P. vulgaris*. Common primrose. The flower when wild is of a pale brimstone hue; but there is a variety purple. The varieties produced by cultivation are, common yellow-flowered; white; paper-white; red; double-yellow; double-white; double-red; double-pink; double-crimson. Found wild in most parts of Europe.

2. *P. elatior*. Oxlip, or great cowslip. Leaves contracted towards the middle; wrinkled, toothed; border of the corol flat, which distinguishes it from the cowslip. Like the last, offers many varieties from variety in its colours; purple, red, golden, orange, with different shades of each.

3. *P. veris*. Common cowslip; or paigle. Border of the corol concave. The varieties are common, single, yellow cowslip; double-yellow cowslip; scarlet-cowslip; hose, and hose-cowslip. The flowers of this plant have a moderately strong and pleasant smell, and a somewhat roughish bitter taste. Vinous liquors impregnated with their flavour by maceration or fermentation, and strong infusions of them drank as tea, are supposed to be mildly corroborant, antispasmodic, and anodyne. An infusion of three pounds of the fresh flowers in five pints of boiling water is made in the shops into a syrup of a fine yellow colour, and agreeably impregnated with the flavour of the cowslip.

4. *P. farinosa*. Bird's-eye primrose. Border of the corol flat; leaves mealy underneath; sometimes found a foot and a half in height.

5. *P. longifolia*. Long-leaved bird's-eye primrose. Leaves serrate, glabrous; umbel nodding; corol with a very long tube. A native of the Alps.

6. *P. cortusoides*. Cortusa-leaved primrose. Leaves wrinkled, lobed; scape many-flowered. A native of Siberia.

7. *P. marginata*. Silver-edged primrose. Leaves obovate, tooth-serrate, edged with white: a native of Switzerland.

8. *P. auricula*. Auricula, or bear's-ear. Leaves serrate, glabrous, obovate, succulent, with mealy edges; flowers varying in colour; the most common yellow or red; not unfrequently purple, and variegated; or with a white eye powdered with meal; scape many-flowered, about as long as the leaves. A native of Switzerland, and Austria; flowers in April and May.

All these species are raised so easily by parting the roots that it is seldom worth while to

rear them from seeds. The double kinds, indeed, can only be increased, without failure, in this way: though if we want original sorts we have recourse to sowing, which should be done in boxes or large pots filled with light rich mould. If the spring should prove dry, the boxes should be frequently watered; and as the heat advances, they must be removed more into the shade. About the middle of May the plants should be transplanted into some shady borders, enriched with heats dung; they should stand at the distance of four inches, and be properly watered till they have taken root. About the end of August let the plants be transplanted, and placed in rows, and six inches asunder, into a border of light, rich earth, exposed to the east. The roots should be constantly removed, and parted, every year, and the earth of the border changed. See Nat. Hist. Pl. CXXXIV.

PRIMUM MOBILE, in the Ptolemaic astronomy, the ninth or highest sphere of the heavens, whose centre is that of the world, and in comparison of which the earth is but a point. This they will have to contain all other spheres within it, and to give motion to them, turning itself, and all them, quite round in 24 hours.

PRINCE. *s.* (prince, Fr. *princeps*, Latin.) 1. A sovereign; a chief ruler (*Milton*). 2. A sovereign of rank next to kings. 3. Ruler of whatever sex (*Camden*). 4. The son of a king. Popularly the eldest son of him that reigns under any denomination is called a prince (*Sidney*). 5. The chief of any body of men (*Pea-cham*).

PRINCE, PRINCERS, in polity, a person invested with the supreme command of a state, independent of any superior.

Prince also denotes a person who is a sovereign in his own territories, yet holds of some other as his superior; such are the princes of Germany, who, though absolute in their respective principalities, are bound to the emperor in certain services.

Prince also denotes the issue of princes, or those of the royal family. In France, before the revolution, they were called princes of the blood; and during the short continuance of the constitution of 1791, French princes. In England the king's children are called sons and daughters of England; the eldest son is created prince of Wales; the cadets are created dukes or earls as the king pleases, and the title of all the children is royal highness: all subjects are to kneel when admitted to kiss their hand; and at table, out of the king's presence, they are served on the knee.

To PRINCE. *v. n.* To play the prince; to take state (*Shakspeare*).

PRINCEDOM. *s.* (from *prince*.) The rank, estate, or power of the prince; sovereignty (*Milton*).

PRINCELIKE. *a.* (prince and like.) Becoming a prince (*Shakspeare*).

PRINCELINESS. *s.* (from *princely*.) The state, manner, or dignity of a prince.

PRINCELY. *a.* (from *prince*.) 1. Having

the appearance of one high born (*Shakspeare*).
 2. Having the rank of princes (*Sidney*). 3. Becoming a prince; royal; grand; august (*Milton*).

PRINCELY. *ad.* In a princelike manner.

PRINCE'S-FEATHER, in botany. See AMARANTHUS.

PRINCE'S-METAL, a mixture of copper and zinc. See ZINCUM.

PRINCE'S WOOD. See HAMELIA.

PRINCE'S ISLAND, a small island on the W. coast of Africa, 250 miles S.W. of Loango. Lon. 6. 40 E. Lat. 1. 49 N.

PRINCE'S ISLAND, a small island of Asia, at the S.W. extremity of the straits of Sunda, a few leagues from the coast of Java. It is very woody, and not much cleared. The inhabitants are Javanese, whose rajah is subject to the sultan of Bantam; and their customs are very similar to those of the natives about Batavia. The best anchoring place is in lon. 105. 17 E. Lat. 0. 36 S.

PRINCE OF WALES CAPE, the most western extremity of all America, hitherto known, discovered by captain Cook in 1778. Lon. 168. 5 W. Lat. 65. 46 N.

PRINCE OF WALES FORT, the most northern settlement of the Hudson's Bay Company, seated on the W. side of Hudson's Bay, at the mouth of Churchill river. Lon. 94. 7 W. Lat. 58. 47 N.

PRINCETON, a town of the United States, in New Jersey, noted for a college, founded in 1738, and called Nassau Hall. It is 42 miles N.E. of Philadelphia, and 53 S.W. of New York. Lon. 74. 34 W. Lat. 40. 22 N.

PRINCE WILLIAM HENRY'S ISLAND, an island in the Eastern Ocean, lying W.N.W. of Tench's island. It is pretty high, well wooded, and 70 miles in circuit. The natives are quite naked, and seem to be the same sort of people as those on Tench's Island, and their canoes of the same construction. It was discovered by lieutenants Ball and King, in 1790. A high mountain rising in the centre of it was called Mount Philip. Lon. 149. 30 E. Lat. 1. 32 S.

PRINCE WILLIAM HENRY'S ISLAND, an island of the South Pacific Ocean, discovered by captain Wallis, in 1767. Lon. 141. 6 W. Lat. 17. 0 S.

PRINCE WILLIAM'S SOUND, a gulf on the N.W. coast of America, so named by captain Cook, in 1778. The men, women, and children, are here all clothed in the same manner. Their ordinary dress is a sort of close robe, which sometimes reaches only to the knees, but generally down to the ancles. They are composed of the skins of various animals, and are commonly worn with the hairy side outward. The men often paint their faces of a black colour, and of a bright red, and sometimes of a blueish or leaden hue; but not in any regular figure. The women puncture or stain the chin with black, that comes to a point in each of their cheeks. Their canoes are of two sorts; the one large and open, the other small and covered: the framing consists

of slender pieces of wood, and the outside is composed of the skins of seals, or other sea animals, stretched over the wood. Their weapons, and implements for hunting and fishing, are the same as those used by the Esquimaux. Our knowledge of the animals of this part of the continent is entirely derived from the skins that were brought by the natives for sale. These were principally of bears, common and pine martens, sea otters, seals, racoons, small ermines, foxes, and the whitish cat or lynx. The birds found here were the halcyon, or great king-fisher, which had fine bright colours; the whiteheaded eagle, and the humming-bird. Few vegetables of any kind were observed; and the trees that chiefly grew about the Sound were the Canadian spruce pine, some of which are of a considerable size. Lon. 147. 21 W. Lat. 59. 33 N.

PRINCESS. *s.* (*princesse*, French.) 1. A sovereign lady; a woman having sovereign command (*Swift*). 2. A sovereign lady of rank, next to that of a queen. 3. The daughter of a king (*Shakspeare*). 4. The wife of a prince: as, *the princess of Wales*.

PRINCESS ANN TOWN, a town of the United States, in Maryland, 114 miles S. of Philadelphia. Lon. 75. 48 W. Lat. 38. 10 N.

PRINCIPAL. *a.* (*principalis*, Latin.) 1. Principally: a latinism (*Spenser*). 2. Chief; of the first rate; capital; essential; important; considerable (*Shakspeare*).

PRINCIPAL. *s.* (from the adjective.) 1. A head; a chief; not a second (*Bacon*). 2. One primarily or originally engaged; not accessory or auxiliary (*Swift*). 3. A capital sum placed out at interest (*Swift*). 4. President or governor.

PRINCIPAL POINT, in perspective, is a point in the perspective plane, upon which a line drawn from the eye perpendicular to the plane falls. It is in the intersection of the horizontal and vertical plane, and called the point of sight, and point of the eye. See PERSPECTIVE.

PRINCIPAL RAY, in perspective, that which passes perpendicularly from the spectator's eye to the perspective plane. See PERSPECTIVE.

PRINCIPALITY. *s.* (*principauté*, Fr.) 1. Sovereignty; supreme power (*Sidney*). 2. A prince; one invested with sovereignty (*Milton*). 3. The country which gives title to a prince; as, *the principality of Wales* (*Temple*). 4. Superiority; predominance (*Taylor*).

PRINCIPALLY. *ad.* (from *principal*.) Chiefly; above all; above the rest (*Newton*).

PRINCIPALNESS. *s.* (from *principal*.) The state of being principal or chief.

PRINCIPATO, a province of Naples, divided into Principato Ulteriore and Principato Citeriore, that is, the Further and Hither Principato. Principato Citeriore is bounded on the N. by Principato Ulteriore, on the W. and S. by the Mediterranean, and on the E. by Basilicata. It is 60 miles long and 30

broad; the soil fertile in wine, corn, oil, and saffron; and it has a great deal of silk, and several mineral springs. Salerno is the capital. Principato Ulteriore is bounded on the N. by the Molise and Terra-di-Lavoro, E. by Basilicata and Capitanata, S. by Principato Citeriore, and W. by the Mediterranean. It is 37 miles long and 30 broad; the soil not fertile in corn or wine, but produces chesnuts, and has excellent pastures. Benevento is the capital.

PRINCIPIATION. *s.* (from *principium*, Lat.) Analysis into constituent or elemental parts: not used (*Bacon*).

PRINCIPLE. *s.* (*principium*, Latin.) 1. Element; constituent part; primordial substance (*Watts*). 2. Original cause (*Dryden*). 3. Being productive of other being; operative cause (*Tillotson*). 4. Fundamental truth; original postulate; first position from which others are deduced (*Hooker*). 5. Ground of action; motive (*Addison*). 6. Tenet on which morality is founded (*Law*).

TO PRINCIPLE. *v. a.* (from the noun.) 1. To establish or fix in any tenet; to impress with any tenet good or ill (*South*). 2. To establish firmly in the mind (*Locke*).

PRINCIPLE (*principium*), a term frequently used for the cause, source, or origin of any thing.

In which sense we say, the principles of thinking, of willing, &c.

In physics, we must ever have recourse to a first principle, which is God.

The Manichees admit of two principles, the one of good, the other of evil; which they establish in the quality of two contrary deities, constantly opposing each other. See **MANICHEE**.

According to the doctrine of Pelagius, our own wills are the principles of our good actions, and we ourselves the principles of our good wills.

Principle is defined, among the school philosophers, to be that from which any thing is, is done, or known; *unde aliquid est, fit, aut cognoscitur*; which is a very extensive signification, and agrees to all kinds of principles.

Thus, the premises are principles, in respect of the conclusion; and thus fire and every other agent are the principles of things which they produce.

The Thomists define principle to the like effect: *id a quo aliquid procedit aliquo modo*.

Philosophers usually distinguish principles into those of being, *principia essendi*; and those of knowing, *principia cognoscendi*, or *principia rei*, and *cognitionis*.

Of the first they make two kinds; viz. principles of origination, which are those from which something proceeds really the same with the principle. And principles of dependency; in which sense, any cause may be a principle, in respect of the thing caused; or a subject, in respect of the accidents inherent in it.

The second is that from which we borrow or derive our knowledge of some other thing; or, it is that which makes the thing be known.

Such are axioms, definitions, hypotheses; such also are examples, explanations, &c.

Philosophers and mathematicians are generally agreed in admitting that there are axioms, that is, certain indemonstrable truths; which must be reckoned among the principles of human knowledge in the strictest sense. Hobbes seems to advance the contrary, when he says, in his logic, or first part of his book de Corpore, that definitions, or their parts, are the only primary propositions (*propositiones primæ*), that is, principles in an absolute and strict sense. But this doctrine of Hobbes cannot be admitted. For, however true it may be in itself, and with respect to the divine mind, it seems certain, that the human mind has never yet attained, and perhaps never will attain to a perfect analysis of its own notions in all cases. And wherever this analysis ceases, definitions cease with it; and where definitions cease, we are forced, if we would demonstrate any thing of the undefined subject, to have recourse to axioms, or to indemonstrable truths admitted by all men, though never yet demonstrated by any one. This will appear evident to those who attentively consider Euclid's Elements.

Bishop Berkeley observes very justly, that the principles of science are neither objects of sense nor imagination, but notions of relation, that is, acts of the mind. Thus, space, time, number, are not objects of sense or imagination, although the things coextended with space or time, or things numbered, be objects of sense. This is most evident in number, which is plainly different from the perception of the things numbered. Nor can the act by which we number be taught or exemplified. For instance, that act of the mind by which we conceive $1 + 1 = 2$, cannot be explained or analysed into others; and supposing it could, we must still stop somewhere, and wherever that be, there is something a disciple must have a *se, non a præceptore*, as Aristotle says. So that, strictly speaking, principles are not taught. And those who maintain them innate, are perhaps not so absurd as Locke pretends. Reflection on Tar Water, art. 264. Ibid, art. 288.

PRINCIPLES. *Principia.* In chemistry. Primary substances. According to modern chemists, this term is applied to those particles which are composed of two or more elements (see **ELEMENTS**), that may again be decomposed by the action of fire or putridity; such as water, gum, resin, &c.

PRINCIPLES (Animal). The component principles of the animal frame may be divided into constituent and elementary. The constituent principles are: 1. Water, which constitutes the greatest part of the humours, and is the vehicle of the other principles. 2. Animal gas, which consists of carbonated hydrogen, and is found not only in the blood, but in all the other fluids. 3. Inflammable gas, emitted from the large intestines, *in flatu*. 4. Animal gluten, which consists of carbon, and azot, and forms the fibres of the solid parts;

P R I N C I P L E S.

the caseous portion of the milk; and the cruor of the blood. 5. Albumen, present in the serum of the blood: 6. Jelly, found in the serum of the blood; lymph of the lymphatic vessels, and other fluids; and the interstices of all the fibres. 7. Cruor, which is the animal gluten impregnated with oxydated iron. 8. Mucus, which lubricates the *primæ viæ*; the aerial surfaces of the lungs; the parts of generation, and the urinary passages. 9. Animal oil, which fills the cells of the adipose membrane. 10. Resin, found in the bile. 11. Sebatic acid, which is present in animal oil. 12. Phosphoric acid, which enters into the composition of the animal earth of the bones, and the phosphorated salts of the urine. 13. Lactic acid, in the sugar of the serum of the milk. 14. Sugar, latent in the serum of the milk. 15. Animal earth, which is a phosphorated calx, and not only forms the greatest part of the bones, but also is found in the fibres of the soft parts, and in all the fluids. 16. Phosphorated volatile alkali, and 17. Phosphorated soda, both of which are detected in the urine. 18. Culinary salt, obtained from the urine, gastric juice, semen, and other humours.

The elementary principles of our body hitherto known, are, 1. Azot, an element which combined with hydrogen constitutes volatile alkali; with the matter of heat, azotic air; with carbon, the gluten of animal fibres. Azot is the primary element of the animal body, for it may be extracted from almost every part of the animal, by means of the nitrous acid, this having a greater affinity with the elements than the azot itself. The mucus, jelly, membranes, tendons, ligaments, and cartilages, afford it in a less degree by means of the nitrous acid. The lymph, serum of the blood, the water of hydropic patients, the liquor amnii, and cheese, give out more. The greatest quantity of azot is obtained from the coagulable lymph of the blood, and from muscle. The flesh of young animals contains less than that of old; and it is in greater quantity in sarcophagous, than in the flesh of phytophagous animals and fish. It is not probable that the azot is produced by the decomposition of the nitre; for after having performed the separation, it is capable of saturating the same quantity of salt of tartar as before. 2. The matter of heat, which enters into the composition of both solids and fluids, and which, in a separate form, constitutes the animal heat. 3. The matter of light, which in its free state produces vision, and, when compounded, enters as an element into the composition of oil and all other inflammable parts. The eyes of animals, which shine in the night-time, owe this property to the matter of light. 4. The electric matter, which enters into all bodies, and affords the phenomena of animal electricity. 5. Oxygen, which, in combination with the matter of heat, constitutes vital air; with hydrogen, forms water; with acescent bases, the acid salts of our fluids. 6. Hydrogen, which, combined with oxygen, forms water; with

azot, volatile alkali; with the matter of heat, inflammable air, which is emitted from the large intestines; and with carbon, animal gass: and lastly, combined with carbon and the sebatic acid, constitutes the oil of the adipose membrane. 7. Carbon, which, in combination with hydrogen and the sebatic acid, constitutes the oil of the adipose membrane; with hydrogen alone, animal gass: with azot, animal gluten. 8. Sulphur, which, combined with inflammable air, constitutes the hepatic air, that exhales from muscular fibres, hair, incubated eggs, animal gluten, and, according to Lavoisier, human excrement. 9. Phosphorus, which, with oxygen, forms the phosphoric acid; and, with inflammable air, phosphoric air. The lucid sweat of some men, the phosphorescence or light given out by the putrifying bodies of some animals, and the phosphorus obtained from cheese and human bones, sufficiently shew that phosphorus constitutes an element of our body. 10. Soda, or the fixed mineral alkali. 11. Potash, or the fixed vegetable alkali. Each of these is found in several of the fluids of the human body. 12. An earthy element. Of the earths, no kind is so frequently detected as the calcareous, which is found in the bones and other parts. 13. A metallic element. Of so great a number of metals, iron and manganese alone are found in an organized body, whether animal or vegetable. Iron is in greater quantity in the flesh than in the bones; but in the greatest porportion in the cruor or red part of the blood. 14. An odorous principle, perceptible in all the animal fluids; but of a peculiar kind in the human urine and excrements. 15. The nervous fluid, contained in the nerves, and which appears to be an element, *sui generis*, distinct from all known fluids, and not to be collected by art. 16. The vital principle. In all solid and fluid parts of a living body there exists an element, with properties peculiar to itself, which constitutes life; hence it is justly called vital. This principle induces a mode of union in the other elements, widely differing from that which arises from the common laws of chemical affinity. By the aid of this principle nature produces the animal fluids, as blood, bile, semen, and the rest, which can never be produced by the art of chemistry. But if, in consequence of death, the laws of vital attraction or affinity cease to operate, then the elements recovering their former properties, become again obedient to the common laws of chemical affinity, and enter into new combinations, from which new principles, or the production of putrefaction, are produced. Thus the hydrogen combining itself with the azot, forms volatile alkali; and the carbonated hydrogen, with the azot, putrid air, into which the whole body is converted. It also appears from hence why organized bodies alone, namely animal and vegetable, are subject to putridity; to which inorganic or mineral substances are in no degree liable, the latter not being compounded according to the laws of vital affinity, but only according to

those of chemical affinity. For the fatiscence or resolution of the pyrites of ferrum sulphuratum in the atmospheric air, is not putrefaction, but only the oxygen, furnished by the air, combining with the sulphur, and forming sulphuric acid. Fire, as well as putridity, separates the constituent principles of animal bodies into their elements; but these, by a peculiar law, under the action of fire again combine in a different manner, and form peculiar constituent principles, called the products of fire. Thus the hydrogen, combining with azot, is changed into volatile alkali; but with a large proportion of carbon, it forms empyreumatic oil. From what has hitherto been said, it will also appear that the true constituent principles of an animal body cannot be detected either by putrefaction or the action of fire; for by these means we only discover the elements of those principles. Thus, whenever volatile alkali is found to be generated, azot and hydrogen may be supposed to have been present in the natural state of the animal substance; and when empyreumatic oil is obtained, it may be concluded it is furnished by the hydrogen and carbon of the animal part.

PRINCOCK. *PRINCOX.* *s.* (from *prink* or *prim cock*.) A cockcomb; a conceited person; a pert young rogue: obsolete (*Shakespeare*).

PRINGLE (Sir John), an eminent physician and philosopher, was a younger son of sir John Pringle of Stichel, in the shire of Roxburgh, baronet; was born in 1707, and took the degree of M. D. at Leyden, 1730; and published there *Dissertatio Inauguralis de Marcere Senili*; 4to. After having been some years professor of moral philosophy at Edinburgh, he was in June 1745 appointed physician to the duke of Cumberland, and physician general to the hospital of the forces in Flanders, where the earl of Stair appears to have been his patron. In February 1746 Dr. Pringle, Dr. Armstrong, and Dr. Barker, were nominated physicians to the hospital for lame, maimed, and sick soldiers, behind Buckingham-house; and in April 1749 Dr. Pringle was appointed physician in ordinary to the king. In 1750 he published *Observations on the Nature and Cure of Hospital and Gaol Fevers*, in a letter to Dr. Mead, 8vo. (reprinted in 1755); and in 1752 he favoured the public with the result of his long experience in an admirable treatise under the title of *Observations on the Disorders of the Army in Camp and Garrison*, 8vo. On the 14th of April 1752 he married Charlotte, second daughter of Dr. Oliver, an eminent physician at Bath. In 1756 he was appointed jointly with Dr. Wintringham (afterwards sir Clifton Wintringham, bart.) physician to the hospital for the service of the forces of Great Britain. After the accession of his present majesty, Dr. Pringle was appointed physician to the queen's household, 1761; physician in ordinary to the queen in 1763, in which year he was admitted of the college of physicians in London; and

on the 5th of June 1766 he was advanced to the dignity of a baronet of Great Britain. In 1772 he was elected president of the royal society, where his speeches for six successive years, on delivering the prize-medal of sir Godfrey Copley, gave the greatest satisfaction. Sir John Pringle in 1777 was appointed physician extraordinary to the king. He was also a fellow of the college of physicians at Edinburgh, and of the royal medical society at Paris; member of the royal academies at Paris, Stockholm, Gottingen, and of the philosophical societies at Edinburgh and Haerlem; and continued president of the royal society till Nov. 1778, when he resigned immediately after delivering the gold medal to Dr. Hutton on account of his very ingenious paper on the force of fired gunpowder. The causes of this resignation we shall not here detail; but refer the reader to the interesting memoirs of sir John, given by Dr. Hutton in the 2d vol. of his well-known Dictionary.

Though sir John Pringle thus quitted his particular relation to the royal society, and did not attend its meetings so constantly as he had formerly done, he still retained his literary connections in general. His house continued to be the resort of ingenious and philosophical men, whether of his own country, or from abroad; and he was frequent in his visits to his friends. He was held in particular esteem by eminent and learned foreigners, few of whom came to England without waiting upon him, and paying him the greatest respect. He treated them, in return, with distinguished civility and regard. When a number of gentlemen met at his table, foreigners were usually a part of the company.

In 1780 sir John spent the summer on a visit to Edinburgh; as he did also that of 1781; where he was treated with the greatest respect. In this last visit he presented to the royal college of physicians in that city the result of many years labour, being ten folio volumes of *Medical and Physical Observations*, in manuscript, on condition that they should neither be published, nor lent out of the library of the college on any account whatever. He was at the same time preparing two other volumes, to be given to the university, containing the formulas referred to in his annotations. He returned again to London, and continued for some time his usual course of life, receiving and paying visits to the most eminent literary men, but languishing and declining in his health and spirits, till the 18th of January 1782, when he died, in the 75th year of his age; the account of his death being every where received in a manner which shewed the high sense that was entertained of his merit.

Among this worthy physician's communications to the royal society, the following are the principal: 1. *Some Experiments on Substances resisting Putrefaction*, *Phil. Trans.* No. 495, p. 580; and No. 496, p. 525, 550; reprinted, with additions, in *Martin's Abridgment*, vol. xi. p. 1365. 2. *Account of some Persons seized*

with the Gaol Fever by working in Newgate, and of the Manner by which the Infection was communicated to one entire Family, vol. xlviii. p. 42. At the request of Dr. Hales, a copy of this useful paper was inserted in the Gentleman's Magazine, 1753, p. 71, before its appearance in the Transactions. 3. A remarkable Case of Fragility, Flexibility, and Dissolution of the Bones, ib. p. 297. 4. Account of the Earthquakes felt at Brussels, vol. xlix. p. 546. 5. Account of sinking of a River near Pontypool, in Monmouthshire, ib. p. 547. 6. Account of an Earthquake felt Feb. 18, 1756, along the Coast of England, between Margate and Dover, ib. p. 579. 7. Account of the Earthquake felt at Glasgow and Dumbarton; also of a Shower of Dust falling on a Ship between Shetland and Iceland, ib. p. 509. 8. Several Accounts of the Fiery Meteor which appeared on Sunday, November 26, 1758; between eight and nine at night, vol. l. p. 218. 9. Account of the Virtues of Soap in dissolving the Stone, in the Case of the reverend Mr. Matthew Simson, ib. p. 221. 10. Account of the Effects of Electricity in Paralytic Cases, ib. p. 481. And see a letter to him on that subject from professor Winthorp. Some Account of the Success of the Vitrum Ceratum Antimonii, was printed in the Edinburgh Medical Essays, vol. v.

To PRINK. *v. n.* (*pronken*, Dutch.) To prank; to deck for show (*Art of Tormenting*).

PRINOS. Winter-berry: In botany, a genus of the class hexandria, order monogynia. Calyx six-cleft; corol one-petalled, wheel-shaped; berry six-seeded. Seven species; natives of America and the West Indies; of which the two following are cultivated.

1. *P. verticillata*. Deciduous winter-berry.

2. *P. glabra*. Ever-green winter-berry. Both shrubby plants, with flowers at the end of the branches, usually blue or purple, appearing in July and August.

To PRINT. *v. a.* (*imprimer*, *empreint*, Fr.)

1. To mark by pressing any thing upon another (*Dryden*). 2. To impress any thing, so as to leave its form (*Roscommon*). 3. To form by impression (*Shakspeare*). 4. To impress words or to make books, not by the pen, but the press (*Pope*).

To PRINT. *v. n.* 1. To use the art of typography (*Shakspeare*). 2. To publish a book (*Pope*).

PRINT. *s.* (*empreinte*, French.) 1. Mark or form made by impression (*Chapman*). 2. That which being impressed leaves its form: as, a *butter print*. 3. Pictures cut in wood or copper to be impressed on paper. 4. Picture made by impression (*Waller*). 5. The form, size, arrangement, or other qualities of the types used in printing books (*Dryden*). 6. The state of being published by the printer (*Shakspeare*). 7. Single sheet printed for sale; a paper something less than a pamphlet (*Ad.*). 8. Formal method. A low word (*Locke*).

PRINTER. *s.* (from *print*.) 1. One that prints books (*Digby*). 2. One that stains linen with figures.

PRINTING, the art of making an impression upon one body by pressing it with another. This art, in some way or other, has been known in all ages. It has been done upon wax, upon plaster, upon iron, by the ancients; their seals, their rings, their money, prove it. It has been done with wooden blocks upon cotton and silk by the Indians. Printing, therefore, in this limited sense, was common to all nations. This art is now divided into four distinct branches: 1. Common, or letter-press printing. 2. Rolling press printing. 3. Calico-printing. 4. Stereotype-printing.

Printing by letter-press is the most curious branch of the art, and demands the most particular notice. It has been often remarked, that as seven cities in Greece disputed for the birth of Homer, so three cities in Europe, Haerlem, Strasbourg, and Mentz, claim the honour of the invention of printing.

Without entering minutely into the disputes which have long agitated the minds of those who have felt a particular interest in this investigation, we state it as our opinion, that Guttemberg was the inventor of the art of printing by moveable types; that he began the art at Strasbourg, and perfected it at Mentz. In this opinion, the earliest writers who mention printing are all agreed.

That the first attempts at printing were made at Strasbourg is, we think, incontestably proved by the following circumstance. John Guttemberg entered into a partnership with Andrew Drizehen-nius, John Riff, and Andrew Heilmann, all citizens of Strasbourg, binding himself to discover to them some important secrets, whereby they should make their fortunes. Each at first contributed eighty florins, and afterwards 125. The workshop was in the house of Andrew Dritzehen, who died. Guttemberg immediately sent his servant Beildeck to Nicholas, the brother of the deceased, to request him to suffer no one to enter the workshop, least the secret should be discovered, and the forms stolen. But this had already been done. This theft, and the claim which Nicholas made to succeed to his brother's share, occasioned a lawsuit, and the evidence of the servant affords explicit and incontrovertible proof in favour of Guttemberg, as the first who practised the art of printing with moveable types. The document, containing the account of this trial, &c. is dated 1439. It was published in the original German, with a Latin version, by Schopflin, in his *Vindiciae Typographicae*. M. Lambinet, in his *Recherches Historiques sur l'Origine de l'Art de l'Imprimerie*, published at Paris a few years ago, says, that the German is obscure, and that every one will interpret the equivocal words in favour of his own opinion. It is, however, manifest that Guttemberg expressly ordered that the forms should be broken up, and the characters dispersed; a fact clearly proving, that the art of printing was at that time a secret, and that moreover it was performed with moveable types. Guttemberg, after having sunk what he and his associates had embarked in this speculation, returned to Mentz, where he was born, and succeeded better in a partnership with Fust.

The evidence in favour of Guttemberg appearing to us decisive, we shall not enter into any examination of the claims advanced by the other candidates for the honour of being the inventor of the art of letter-press printing. The names of those persons were John Fust, Mentz; John

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Mental, of Strasbourg; and L. John Koster, of Haerlem. When the city of Mentz was taken by Adolphus, count of Nassau, in 1462, Fust, and Schoeffer, servant and son-in-law to Fust, suffered materially with their fellow townsmen. Their associates and workmen dispersed to seek their fortunes, and the art was thus diffused over Europe. When it was first established at Paris, the copiers, finding their business so materially injured, presented a memorial of complaint to the parliament, and that tribunal, as superstitious as the people, who took the printers for conjurers, had their books seized and confiscated. Louis XI. who, bad as he was, was the friend and patron of letters, forbade the parliament to take any farther cognizance of the affair, and restored their property to the printers.

The art of printing now began to spread itself over a great part of Europe with astonishing rapidity. It was practised at Rome in the year 1467, and the year following it was introduced into England by Thomas Bouchier, archbishop of Canterbury, who sent W. Turner, master of the robes, and W. Caxton, merchant, to the continent to learn the art. Turner and Caxton met with one Corseilles, an under-workman, whom they bribed with considerable presents and large promises, to come over to England, and instruct them in the art. This business having been accomplished, a press was set up at Oxford, which was afterwards removed to St. Albans, and after that to Westminster Abbey. The learned Dr. Conyers Middleton, and others, are inclined to doubt the truth of this part of the history of printing. It is certain, that Caxton did not return immediately to England, but continued some time on the continent, following the business of a printer. Indeed, both the origin and the history of the first introduction of the art of printing into this country are involved in doubt and obscurity, and nothing has ever yet been published perfectly satisfactory on this subject. We will, therefore, proceed to an account of

The method of printing.—The workmen employed in this art are compositors and pressmen. The first are those persons whose business it is to range and dispose the letters into words, lines, pages, &c. The pressmen are those who, properly speaking, are the printers, as they take off the impressions from the letters after they are prepared for that purpose by the compositors. The types being provided for the compositor, he distributes each kind, or sort, by itself, into small cells or boxes, made in two wooden frames, called the cases; the upper-case and the lower-case. The cells in the upper-case are ninety-eight in number; those of the lower-case are fifty-four.

The upper-case contains two alphabets of capitals; large, or full capitals, and small capitals. They also contain cells for the figures, the accented letters, the characters used in references to notes, &c.; and one cell, being a middle one in the bottom row, for the small letter, k. The capitals in this case are disposed alphabetically.

The lower-case is appropriated to the small letters, the double letters, the points, parentheses, spaces, and quadrats. The boxes of the lower-case are of different sizes; the largest being for the letters most in use; but the arrangement is not in this instance alphabetical, those letters oftenest wanted being placed nearest to the compositor's hand. As there is nothing on the outside of the boxes to denote the letters they respectively contain, it is curious to observe the

dexterity manifested by the compositor in finding and taking up the letters, as he wants them, from the different cells. Each case is placed in an inclined direction, that the compositor may reach the upper-case with ease.

The instrument in which the letters are set is called a composing-stick, which consists of a long plate of brass or iron, on the side of which arises a ledge, which runs the whole length of the plate, and serves to support the letters, the sides of which are to rest against it. Along this ledge is a row of holes, for introducing a screw to lengthen or shorten the line, by moving the sliders farther from, or nearer to, the shorter ledge at the end of the composing stick. Where marginal notes are required, the two sliding pieces are opened to a proper distance from each other. Before the compositor begins to compose, he puts a thin slip of brass plate, called a rule, cut to the length of the line, and of the same height as the letter, in the composing stick, parallel with the ledge, against which the letters are intended to bear. The compositor being thus furnished with an instrument suited to hold the letters as they are arranged into words, lines, &c. he places his copy on the upper-case, just before him, and holding the stick in his left hand, his thumb being over the slider, with the right he takes up the letters, spaces, &c. one by one, and places them against the rule, while he supports them, with his left thumb, by pressing them against the slider, the other hand being constantly employed in setting in other letters. Having in this manner composed a line, he takes the brass rule from behind it, places it before the letters of which it is composed, and proceeds to compose another line in the same manner. But before he removes the brass rule, he notices whether the line ends with a complete word, or with an entire syllable of a word, including the hyphen that is put to denote the division, when a word is divided into syllables. If he finds that his words exactly fill the measure, he has nothing more to do with that line, but proceeds with the next. But if he finds the measure not entirely filled at the ending of a word or syllable, he puts in more spaces, diminishing the distances between the words, until the measure is full; and this operation, which is called justifying, is done in order that all the lines in the composing-stick may be of equal length. Much depends upon exactness in justifying; and great care is taken by expert compositors that the lines are neither too closely wedged into the composing stick, nor yet loose and uneven.

The spaces are pieces of metal, of various thicknesses, exactly shaped like the shanks of the letters. They are used to regulate the distances between the words.

When the composing-stick has been filled with lines, being generally in number about ten or twelve, the compositor empties upon a thin board called a galley, being of an oblong shape, with a ledge on two sides, and a groove, to admit a false bottom. When the compositor has filled and emptied his stick until he has composed a page, he ties it up with a piece of packthread, and removes it from the galley, either to the imposing-stone, or to such other safe and convenient place as he may think proper. And in this manner he proceeds until he has composed as many pages as are required to make a sheet, or, in some instances, a half-sheet. He then proceeds to arrange the pages on the imposing-stone, which is a very large oblong stone, of about five or six inches

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in thickness. The pages are so arranged, that, when they are printed, they may be folded so as to follow each other regularly. Great care, and some ingenuity, is requisite in the imposing of a sheet or half-sheet, particularly of works in sizes less than folio or quarto. In Stower's Printer's Grammar, a very excellent and copious work on the subject of printing, are given upwards of fifty schemes of imposition, of sheets of almost every possible size.

Having laid down or disposed the pages in right order on the imposing stone, the compositor proceeds to what is called dressing the chases. The chase is a rectangular iron frame, of different dimensions, according to the size of the paper to be printed; having two cross pieces, of the same metal, called a long and short cross, mortised at each end so as to be taken out occasionally. By the different situations of these crosses the chase is fitted for different volumes; for folios, quartos, octavos, &c. To dress the chase, a set of furniture is necessary, consisting of small slips of wood of different dimensions. The first thing to be done, is to lay the chase over the pages; after this, that part of the furniture called gutter-sticks, are placed between the respective pages. Then another part of the furniture called reglets are placed along the sides of the crosses of the chase. The reglets are of such a thickness as will let the book have proper margins after it is bound. Having dressed the inside of the pages, the compositor proceeds to do the same with their outsides, by putting side-sticks and foot-sticks to them. Thus the pages being placed at proper distances, they are all untied, and fastened together by small wooden wedges, called quoins. These small wedges, being firmly driven up the sides and feet of the pages, by means of a mallet, and a piece of hard wood called a shooting-stick, all the letters are fastened together. The work in this condition is called a form, and is ready for the pressman, who lays it upon the press, for the purpose of pulling a proof. When a proof is pulled, the form or forms are rubbed over with a brush, dipped in ley, made of pearl-ash and water; they are then carefully taken off the press, and the proof and forms delivered to the compositor's further care.

As it is impossible for the most careful compositor so to compose all his sheets as that they shall not require to be carefully read and corrected before they are finally worked-off, the next thing to be done is to put the proof, along with the copy from which it has been composed, into the hands of the reader or corrector, whose business is to read over the whole proof two or three times with great care and attention, marking such errata in the margin of every page as he shall observe.

The corrections are always placed against the line in which the faults are found. There are different characters used to denote different corrections: thus ~ is put to signify that a word is divided that ought to be in one, as *person* instead of *person*; a mark resembling the Greek theta θ is put for *dele*, to intimate that something, as a point, letter, word, &c. dashed in that line, is to be taken out. If any thing is to be inserted, the place of insertion is marked with a caret, $\wedge$, and the thing to be inserted written in the margin. Where a space is wanting between two words, or letters, that are intended to be separated, a parallel line must be drawn where the separation ought to be, and a mark, somewhat resembling a sharp in music $\sharp$, placed in the margin. An inverted letter or word is noticed by making

a dash under it, and a mark, nearly resembling the *dele* character reversed.

Mr. Stower observes, that marking turned letters tries a corrector's skill in knowing the true formation of them; without which it would be better to mark them in the same manner as they do wrong letters, which is done by dashing out the wrong letter, and writing the right one in the margin, unless they are very sure that they can distinguish b, d, n, o, p, q, s, u, x, z, when they are turned, from the same letters with their nick the right way. Where a space rises up between two words, it is noticed by a cross + in the margin. When any thing is transposed it is denoted thus:

1 4 3 2
~~~~~  
You                      merit                      your                      mistake

for *You mistake your merit*; and in the margin is added *tr.* for transposition. Where a new paragraph is required, a line in the shape of a crochets [ is made, and the same mark placed in the margin; also where a paragraph ought not to have been made, a line is drawn from the broken-off matter to the next paragraph; and in the margin is written *No break*. If Italic letters are to be changed for Roman, or *vice versa*, a line is drawn, thus —, under the letters, and *Rom.* or *Ital.* is written in the margin. Where words have been struck out that are afterwards approved of, dots are marked under such words, and in the margin is written the word *slet*. Where the punctuation is required to be altered, the semicolon, colon, and period, are encircled in the margin. The comma and other points are marked as letters and words, viz. with a long oblique line immediately before them; which line is intended to separate the different corrections from each other that occur in the same line. When letters of a different fount or size are improperly introduced into the page, they are noticed by a small dash drawn through them, and the letters *w. f.* in the margin. There are some other marks used in correcting; such as  $\surd$  for superior; where it is necessary to insert the apostrophe, the star, or other reference marks, and superior letters: *Cap.* for capitals, *L. C.* for lower case, &c.

After a proof sheet has been read, and the errata thus noticed by the corrector, or, as he is more usually called, the reader, it is again put into the hands of the compositor, who proceeds to correct in the metal what has been marked for correction in the proof. He then unlocks the form on the imposing stone, by loosening the quoins or wedges which bound the letters together. He then casts his eye over one page of the proof, noticing what letters, &c. are required. Having gathered as many corrections, from the cases, between the thumb and fore-finger of his left hand, as he can conveniently hold, and an assortment of spaces, on a piece of paper, or in a small square box with partitions in it, he takes a sharp-pointed steel bodkin in his right hand. Placing the point of the bodkin at one end of the line, and the fore-finger of his left hand against the other, he raises the whole line sufficiently high to afford him a clear view of the spacing. He then changes the faulty letters or words, and alters his spaces before he drops the line.

The first proof being corrected, another is pulled, to be again put into the hands of the reader, or sent to the author for examination. This proof being read and corrected as before, a revise is pulled, to see whether all the errors marked in the



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last proof are properly corrected. When the sheet is supposed to be correct, the forms are given to the pressman, whose business it is to work them off when they are so prepared and corrected: in doing which four things are required; paper, ink, balls, and a press. The paper is prepared for use by being dipped, a few sheets at a time, in water, and afterwards laid in a heap sheet over sheet, to make the water penetrate equally into every sheet, a thick deal board is laid upon the heap, on which is placed heavy weights according to the size of the heap. The reason why the paper is to be wetted before it is in a fit state to be printed upon, is, that it may be made sufficiently soft to adhere closely to the surface of the letter, and take up a proper quantity of ink, that it may receive a fair and clear impression. It is also necessary to wet the paper, lest its stiff and harsh nature, when dry, should injure the face of the letters.

The ink used by printers has already been treated of in the article *INK*, which see. The manufacture of good common ink seems to be as yet but very imperfectly understood. That used in fine printing has been more attended to, and many of our best printers are now able to produce impressions in a great degree free from that offensive brown cast which is to be observed in many books printed with what is called common ink.

The balls used in laying the ink on the forms are a kind of wooden funnels, with handles, the cavities of which are stuffed with wool or hair, and covered over with a pelt prepared for the purpose. One skin generally makes two proper sized balls. When the skin has been sufficiently soaked in urine, which will take about fourteen or fifteen hours, it is taken out and curried, by putting it round an iron called a currying iron, or round some upright post: the pressman taking hold of each end of it, and drawing it with as much force as possible backwards and forwards, till it is rendered soft and pliable. He then cuts the skin exactly in two, puts them under his feet, and continues to tread them till they are so dry as to stick to the foot in treading. The skin is then laid on a board or flat stone, and stretched as much as possible by rubbing the ball-stock upon it. It is then nailed upon the ball-stock in plaits about an inch wide, thrusting in as much wool as the cavity of the stock and the skin will conveniently hold. If, however, too much wool were to be put in, it would render the balls hard and difficult to work with. If too little wool is in the balls, they soon flap and wrap over into wrinkles, so as to prevent an equal distribution of the ink on their surface. When the balls are thus knocked up, as it is termed, they are dipped in urine, and scraped with a blunt knife until they are perfectly clean; they are then dried with a clean sheet of stout paper, and patted with the hand until no moisture remains on the surface. The balls, when they are completed, have much the shape and appearance of a very large mallet, used by stone-masons, except that their surface is much broader and rounder.

The press is a curious and complex machine, for which and its use, see a succeeding article.

**PRINTING (Stereotype).** Perhaps it would not have been improper to have treated of stereotype printing even before that of common printing: for the first ideas of this art were certainly anterior to those of printing by moveable types.

The method of printing linen and paper for hangings has been known in the east from time immemorial. Printing from wooden blocks, by the Jesuits, has been practised above sixteen hundred

years in China. According to this plan, when an author chooses to print his work, he has it fairly transcribed upon a thin and transparent paper. Each leaf is then reversed and fastened upon a smooth block of hard wood, upon which the engraver cuts the characters, in relief. There must be, therefore, a separate block for every page.

At the end of the fourteenth and beginning of the fifteenth century, the Italians, Germans, Flemings, and Dutch, began at the same time to engrave on wood and copper: but the previous advances had been gradual. The inscriptions in relief, upon monuments and altars, in the cloisters and over church porches, served as models for block-printing. The letters upon painted windows greatly resemble those in the books of images. The invention of cards was an intermediate step. Bullet, in his *Recherches Historique sur les Cartes à jouer*, has proved from old chronicles, in particular from that of Pettit-Jean de Sanitre, from edicts civil and ecclesiastical, and from the figures of the cards, that they were invented towards Charles the Fifth's reign, about the year 1376. By the shape of the crowns, and the sceptres with the *fleur de lis*, he infers that the French invented them. They soon were introduced into Spain, Italy, Germany, and England. The names of the suits seem rather to imply a Spanish or Italian origin. At first the cards were painted; about the year 1400 a method was devised of printing them from blocks. To this we may directly trace the art of printing. The books of images form the next step. These also were printed from wooden blocks; one side of the leaf only is impressed, and the corresponding text is placed below, beside, or proceeding from the mouth of the figure. Of these scarce books M. Lambinet mentions seven: 1. *Figuræ typicæ veteris atque antitypicæ novi testamenti*. This is the work which in Germany is called the Bible of the Poor, because it was originally designed as an abridgment of the Bible for those who could not purchase the whole scriptures in manuscript, and who probably could not read. There is one copy of this work in the Bodleian Library, and another at Christ's College, Cambridge. 2. *Historia S. Joannis Evangelistæ, ejusque visiones apocalypticæ*. 3. *Historia seu Providentia Virginis Mariæ, ex cauto canticorum*. 4. *Ars moriendi*. 5. *Ars memorandi notabilis per figuras Evangelistarum*. 6. *Donatus, seu grammatica brevis in usum scholarum conscripta*. It is not easy to conceive how this can be classed among the books of images. 7. *Speculum humanæ salvationis*. There is said to be an English translation of this work. Two other books of images, the *Twrdanck*, and the *Triumpf-wagen*, are posterior to the common use of printing. It is clear, therefore, from the cotton and silk printing of the Indians, the Chinese block-printing, and these books of images; and perhaps, also, from the bardic mode of writing, who cut their poems upon bars of wood, arranged like a gridiron, and which they called carrying a book, that the idea of stereotype printing is by no means of modern origin. That it was prior to the art of printing with moveable types there can be no doubt; since this latter mode of printing was first suggested by the Catholicon, which was printed with wooden tablets, in a series, and composed in forms. This mode of printing, except in China, where it is still practised, was laid aside soon after the invention of the common letter-press printing.

The history of the invention of modern stereo-

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type is, like that of common-printing, involved in some obscurity as to the name of the person to whom justly belongs the honour of an invention so useful and curious. Mr. Andrew Tilloch, the worthy and ingenious editor of the *Philosophical Magazine*, has given the following extract, translated from *Ni-we Algemein Konst en Letter Bode*, 1798, No. 232, which deserves particularly to be noticed. "Above a hundred years ago the Dutch were in possession of the art of printing with solid or fixed types, which in every respect was superior to that of Didot's stereotype. It may, however, be readily comprehended that their letters were not cut in so elegant a manner, especially when we reflect on the progress which typography has made since that period." Samuel and J. Leuchtmann, booksellers at Leyden, have still in their possession the forms of a quarto Bible, which were constructed in this ingenious manner. Many thousand impressions were thrown off, which are in every body's hand, and the letters are still good.

"The inventor of this useful art was J. Vander Mey, father of the well-known painter of that name. About the end of the sixteenth century he resided at Leyden. With the assistance of Muller, the clergyman of the German congregation there, who carefully superintended the correction, he prepared and cast the plates for the above-mentioned quarto Bible. This Bible he published also in folio, with large margins, ornamented with figures; the forms of which are still in the hands of Elwe, bookseller, at Amsterdam; also an English New Testament, and Schaaf's Syriac Dictionary; the forms of which were melted down: likewise a small Greek Testament, in 18mo.

"As far as is known, Vander Mey printed nothing else in this manner; and the art of preparing solid blocks was lost at his death, or at least was not afterwards employed." The Dutch editor supposes that the reason Vander Mey's invention was dropped was, that "though this process in itself is very advantageous, it is far more expensive than the usual method of printing, except in those cases where such works are to be printed as are indispensably necessary, and of standing worth." Mr. Tilloch, however, is of a directly contrary opinion.

In the year 1781 was printed, by and for J. Nichols, London, a very interesting pamphlet, entitled *Biographical Memoirs of William Ged*; including a particular account of his progress in the art of block-printing. The first part of the pamphlet was printed from a MS., dictated by Ged some time before his death; the second part was written by his daughter, for whose benefit the profits of the publication were intended; the third is a copy of proposals that had been published by Mr. Ged's son, in 1751, for reviving his father's art, and to the whole is added Mr. Mores's Narrative of Block Printing.

It appears from this publication, that, in the year 1725, Mr. Ged began to prosecute plate-printing. In 1727, he entered into a contract with a person who had a little capital, but who, on conversing with some printer, got so intimidated, that, at the end of two years, he had laid out only twenty-two pounds. In 1729, he entered into a new contract with a Mr. Fenner, Thomas James, a type-founder, and John James, the architect. Sometime after, a privilege was obtained from the University of Cambridge, to print bibles and prayer-books; but it appears, that one of his partners was actually averse to the success of the plan, and engaged such people for the work as he

thought most likely to spoil it. A straggling workman, who had wrought with them, informed Mr. Mores, that both bibles and common prayer-books had been printed; but that the compositors, when they corrected one fault, made purposely half a dozen more; and the pressmen, when the masters were absent, battered the letter in aid of the compositors. In consequence of these base proceedings, the books were suppressed by authority, and the plates sent to the King's printing-house, and from thence to Mr. Caslon's foundry. "After much ill usage," says Mr. Tilloch, "Ged, who appears to have been a person of great honesty and simplicity, returned to Edinburgh. His friends were anxious that a specimen of his art should be published, which was at last done by subscription. His son, James Ged, who had been apprenticed to a printer, with the consent of his master set up the forms in the night-time, when the other compositors were gone, for his father to cast the plates from; by which means Sallust was finished in 1736." Mr. Tilloch has not only a copy of this work, but also the plate of one of the pages. Besides Sallust, Mr. Tilloch has another work, printed some years after from plates of Mr. Ged's manufacture. The book is *The Life of God in the Soul of Man*, printed on a writing pot, 12mo. and with the following imprint: "Newcastle, printed and sold by John White, from plates made by William Ged, Goldsmith in Edinburgh, 1742."

Fifty years after the invention of plate-printing by Mr. Ged, Mr. Tilloch made a similar discovery, without having, at the time, any knowledge of Ged's invention. In perfecting the invention, Mr. Tilloch had the assistance and joint labour of Mr. Foulis, printer to the University of Glasgow. After great labour, and many experiments, these gentlemen "overcame every difficulty, and were able to produce plates, the impressions from which could not be distinguished from those taken from the types from which they were cast." "Though we had reason to fear," says Mr. Tilloch, "from what we [afterwards] found Ged had met with, that our efforts would experience a similar opposition, from prejudice and ignorance, we persevered in our object for a considerable time, and at last resolved to take out patents for England and Scotland, to secure ourselves, for the usual term, the benefits of our invention; for the discovery was still as much our own as if nothing similar had been practised before. Ged's knowledge of the art having died with his son, whose proposals for reviving it, published in 1751, not having been followed with success, he went to Jamaica, where he died. The patents were accordingly obtained; nay, they are even expired; and yet we hear people, who only began their stereotype labours yesterday, talking to themselves the merit of being the first inventors!" "Owing to circumstances of a private nature;" not, however, connected with the stereotype art, the business was laid aside for a time; and Mr. Tilloch having removed from Glasgow to London, the concern was dropped altogether; not, however, till several small volumes had been stereotyped and printed, under the direction of Messrs. Tilloch and Foulis.

Some time elapsed after this, when Didot, the celebrated French printer, applied the stereotype art to logarithmic tables, and afterwards to several of the Latin classics, and to various French publications. It has been said, by the French, that the merit of the invention properly belongs to Didot; but by what we have already laid before our readers, it is evident this cannot have been the case.





*Composingstick.*

*Fig. 1.*



*Fig. 2.*

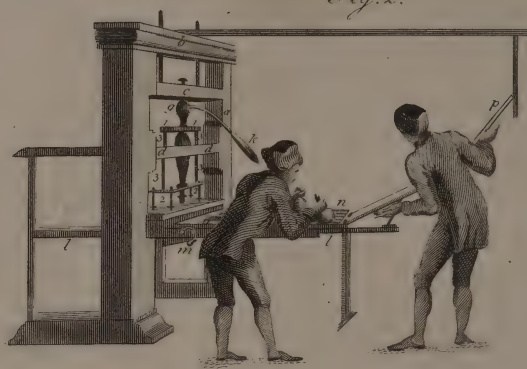


*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



*Fig. 10.*

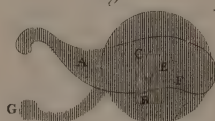


*Fig. 11.*

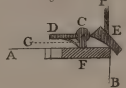


*Fig. 7.*



*Fig. 8.*



*Fig. 9.*



*Fig. 13.*



*Fig. 12.*

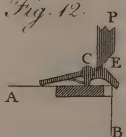
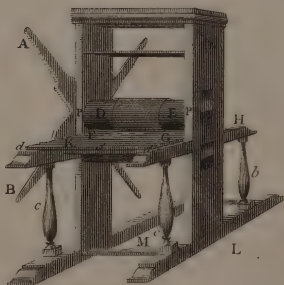


*Fig. 14.*



*Fig. 15.*





# PRINTING.

Some years after Mr. Tilloch had given up the prosecution of this art, Mr. Wilson, a printer of respectability in London, engaged with earl Stanhope for the purpose of bringing it to perfection, and eventually to establish it in this country. His lordship, it is said, received his instructions from Mr. Tilloch, and had afterwards the personal attendance of Mr. Foulis, for many months, at his seat at Chevening, where his lordship was initiated in the practical part of the operation.

After two years application, Mr. Wilson announced to the public "that the genius and perseverance of earl Stanhope," whom he styles "the Right Honourable Inventor" had overcome every difficulty; and that accordingly, the various processes of the stereotype art had been so admirably contrived, combining the most beautiful simplicity with the most desirable economy, the *ne plus ultra* of perfection with that of cheapness, as to yield the best encouragement to the public for looking forward to the happy period when an application of this valuable art to the manufacture of books would be the means of reducing the price of all standard works at least thirty, and in many cases fifty per cent.

In January, 1804, the stereotype art, (with the approbation of lord Stanhope,) was offered by Mr. Wilson to the university of Cambridge, for their adoption and use in the printing of bibles, testaments, and prayer-books, upon certain terms and conditions highly advantageous to Mr. Wilson; for with his lordship's characteristic generosity, earl Stanhope has uniformly declined to accept even the reimbursement of any part of the monies by him expended in the prosecution of this ingenious art. Some differences, however, arising between Mr. Wilson and the syndics of the university, the contract was dissolved; and Mr. Wilson published his case in a stereotyped pamphlet, entitled *Arbitration between the University of Cambridge and Andrew Wilson*.

That Mr. Wilson might make out his case more clearly, he has given a computation of the nonpareil bible,—showing the expenditure by both methods of printing, upon composition, reading, wear of type, and charge of composition; and upon paper, press-work, charges on press-work, and insurance. This computation is, of course, much in favour of the stereotype art; amounting indeed to nearly one half, or fifty per cent. saved by the new method. In addition to the saving attributed to stereotype printing, it is said that, as every page of the most extensive work has a separate plate, all the pages of the said work must be equally new and beautiful: which cannot be the case with single types, which are distributed and recomposed several times over in the course of a large work. The stereotype art also, it is said, possesses a security against error. This advantage is much insisted on by the friends of the art; but with what consistency, we confess, does not immediately appear: for, strange as it may seem, after all the care that we may naturally suppose was taken to render Mr. Wilson's pamphlet a model of stereotype perfection, it is still not without its errata. The pamphlet consists of about forty-four pages; and on the forty-first page, in a line containing only two monosyllables, there is an error: viz. *void* for *void*. There are one or two other trifling inaccuracies in the pamphlet.

Indeed, as every work hitherto stereotyped clearly manifests, it is not possible that first editions of

works should be more correct when stereotyped than when printed in the common way; and it ought not to be forgotten that an error stereotyped in the first edition is perpetuated through every subsequent edition. It is said, that stereotype plates admit of alteration: this, however, if carried to any extent, must be attended with a very considerable expense.

In short, we think that the stereotype art has much the advantage of common printing in standard books of very extensive circulation and constant demand, and wherein no alteration, as to plan or size, is allowed ever to take place: but for the common and most general purposes of the art of printing, the method by moveable types is incomparably the best.

PRINTING PRESS, the apparatus by means of which the impression of the letters in a form is made upon the previously blank sheet. The body of this machine, according to the common construction, consists first of two strong vertical posts, *a, a*, (pl. 144, fig. 2) called cheeks, and joined together by four cross-pieces; the cap *b*; the head *c*, which is moveable, being partly sustained by two iron pins or long bolts that pass the cap; the till or shelf *d d*, by which the spindle and its apparatus are kept in their proper position; and the winter *e*, which bears the carriage, and sustains the effort of the press beneath. The spindle *f* is an upright piece of iron pointed with steel, having a male screw which goes into the female one in the head about four inches. Through the eye *g* of this spindle is fastened the bar *k*, by which the pressman makes the impression. The spindle passes through a hole in the middle of the till; and its point works into a brass pan or nut, supplied with oil, which is fixed to an iron plate let into the top of the platten. The body of the spindle is sustained in the centre of an open frame of polished iron, 1, 1, 2, 2, 3, 3, fixed to it in such a manner as without obstructing its free play, to keep it in a steady direction; and at the same time to serve for suspending the platten. This frame consists of two parts: the upper called the garter, 1, 1; the under, called the crane, 2, 2. These are connected together by two short legs or bolts, 3, 3; which being fixed below in the two ends of the crane, pass upward, through two holes in the till, and are received at top into two eyes at the ends of the garter, where they are secured by screws. The carriage *l* is placed a foot below the platten, having its fore-part supported by a prop called the fore-stay, while the other rests on the winter. On this carriage, which sustains the plank, are nailed two long iron bars or ribs; and on the plank are nailed short pieces of iron or steel called cramp irons, equally tempered with the ribs, and which slide upon them when the plank is turned in or out. Under the carriage is fixed a long piece of iron called the spit, with a double wheel in the middle, round which leather-girts are fastened, nailed to each end of the plank: and to the outside of the spit is fixed a rounce *m*, or handle to turn round the wheel. Upon the plank is a square frame or coffin, in which is enclosed a polished stone on which the form *n* is laid; at the end of the coffin are three frames, viz. the two tympan and frisket: the tympan *o* are square, and made of three slips of very thin wood, and at the top a piece of iron still thinner; that called the outer tympan is fastened with hinges to the coffin: they are both covered with parchment; and between the two are placed blankets, which are necessary to take off the impression of the

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letters upon the paper. The frisket *p* is a square frame of thin iron, fastened with hinges to the tympan: it is covered with paper cut in the necessary places, that the sheet, which is put between the frisket and the great or outward tympan, may receive the ink, and that nothing may hurt the margins. To regulate the margins, a sheet of paper is fastened upon this tympan, which is called the tympan sheet; and on each side is fixed an iron point, which makes two holes in the sheet; which is to be placed on the same points when the impression is to be made on the other side. In preparing the press for working, the parchment which covers the outer tympan is wetted till it is very soft, in order to render the impression more equable; the blankets are then put in, and secured from slipping by the inner tympan: then while one pressman is beating the letter with the balls *g*, covered with ink taken from the ink-block, the other person places a sheet of white paper on the tympan-sheet; turns down the frisket upon it, to keep the paper clean and prevent its slipping; then bringing the tympan upon the form, and turning the rounce, he brings the form with the stone, &c. weighing about 300 lbs. weight, under the platten; pulls with the bar, by which means the platten presses the blankets and paper close upon the letter, whereby half the form is printed; then easing the bar, he draws the form still forward; gives a second pull; and letting go the bar, turns back the form, takes up the tympan and frisket, takes out the printed sheet, and lays on a fresh one; and this is repeated till he has taken off the impression upon the full number of sheets the edition is to consist of. One side of the sheet being thus printed, the form for the other is laid upon the press, and worked off in the same manner.

To the above description of the printing press, we shall add that of one invented by Mr. Nicholson, and for which a patent was granted in 1790. This machine is recommended by the inventor as being superior to other printing presses in cheapness, accuracy, and neatness, and is adapted with some slight variations in its construction for printing on paper, linen, cotton, and woollen. Three particulars are to be attended to in the invention.

1st, The manner of preparing and placing the types, engravings, or carvings, from which the impression is to be made; 2dly, In applying the ink or colouring matter to types or engravings; and 3dly, In taking off the impression.

1st, The moulds, punches, and matrices, for casting letters, are made in the same manner, and with the same materials, as other letter-founders do, excepting that instead of leaving a space in the mould for the stem of one letter only, he leaves spaces for two, three, or more letters, to be cast at one pouring of the metal; and at the lower extremity of each of those spaces (which communicate by a common groove at top) he places a matrix, or piece of copper, with the letter punched upon its face in the usual way. And moreover, he brings the stem of his letters to a due form and finish, not only by rubbing it upon a stone, and scraping it when arranged in the finishing-stick, but likewise by scraping it, on one or more sides, in a finishing-stick, whose hollowed part is less deep at the inner than the outer side. He calls that side of the groove which is nearest the face of the disposed letter, the outer side; and the purpose accomplished by this method of scraping is, that of rendering the tail of the letter gradually

smaller the more remote it is, or farther from the face. Such letters may be firmly imposed upon a cylindrical surface, in the same manner as common letters are imposed upon a flat stone.

2dly, The ink or colouring matter is applied to the types, forms, or plates, by causing the surface of a cylinder, smeared or wetted with the colouring matter, to roll over the surfaces of the said forms or plates, or by causing the forms or plates to apply themselves successively to the surface of the cylinder. The surface of this colouring cylinder is covered with leather, or with woollen, linen, or cotton-cloth. When the colour to be used is thin, as in calico-printing, and in almost every case, the covering is supported by a firm elastic stuffing, consisting of hair, or wool, or woollen cloth wrapped one or more folds round the cylinder. When the covering consists of woollen cloth, the stuffing must be defended by leather, or oilskin, to prevent its imbibing too much colour, and by that means losing its elasticity. It is absolutely necessary that the colouring matter be evenly distributed over the surface of the cylinder; and for this purpose, when the colour is thick and stiff, as in letter-press printing, he applies two, three, or more small cylinders, called distributing-rollers, longitudinally against the colouring cylinders, so that they may be turned by the motion of the latter; and the effect of this application is, that every lump or mass of colour which may be redundant, or irregularly placed upon the face of the colouring cylinder, will be pressed, spread, and partly taken up, and carried by the small rollers to the other parts of the colouring cylinder; so that this last will very speedily acquire and preserve an even face of colour. But if the colouring matter be thinner, he does not apply more than one or two of these distributing rollers; and, if it be very thin, he applies an even blunt edge of metal, or wood, or a straight brush, or both of these last, against the colouring cylinder, for the purpose of rendering its colour uniform. When he applies colour to an engraved plate, or cylinder, or through the interstices of a perforated pattern, as in the manufacturing some kinds of paper-hangings, he uses a cylinder entirely covered with hair or bristles in the manner of a brush.

3dly, The impressions, even in letter-press printing, are performed by the action of a cylinder or cylindrical surface. The following is the construction of this machine. Fig. 3. represents a printing-press, more especially applicable to the printing of books. A and E are two cylinders, running or turning in a strong frame of wood, or metal, or both. The cylinder A is faced with woollen cloth, and is capable of being pressed with more or less force upon HI, by means of the lever M. HI is a long table, which is capable of moving endwise, backwards and forwards, upon the rollers E and K. The roller A acts upon this table by means of a cog-wheel, or by straps, so as to draw it backwards and forwards by the motion of its handle L. The table is kept in the same line by grooves on its sides, which contain the cylinder A. D is a chase, containing letter set up and imposed. B is a box, containing a colouring-roller, with its distributing-rollers CC; it is supported by the arm N. O is a cylinder faced with leather, and lying across an ink-block; this cylinder is fixed by the middle to a bended lever moveable on the joint Q.

The action. When D, or the letter, is drawn beneath the cylinder B, it receives ink; and when it has passed into the position R, a workman



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places or turns down a tympan with paper upon it (this tympan differs in no respect from the usual one, except that its hinge opens sidewise); it then proceeds to pass under the cylinder A, which presses it successively through its whole surface. On the other side, at S, the workman takes off the paper, and leaves the tympan up. This motion causes the cylinder B to revolve continually, and consequently to render its inked surface very uniform, by the action of its distributing-rollers CC; and, when the table has passed to its extreme distance in the direction now spoken of, the arm G touches the lever P, and raises the cylinder O off the ink-block, by which means it dabs against one of the distributing rollers, and gives it a small quantity of ink. The returning motion of the table carries the letter again under the roller B, which again inks it, and the process of printing another sheet goes on as before.

Fig. 4. is another printing press. In this, B is the inking-roller; A is a cylinder, having the letter imposed upon its surface; and E is a cylinder, having its uniform surface covered with woollen cloth: these three cylinders are connected, either by cogs or straps at the edges of each. The machine is uniformly turned in one direction by the handle L. The workman applies a sheet of paper to the surface of E, where it is retained, either by points in the usual manner, or by the apparatus to be described in treating of fig. 4. The paper passes between E and A, and receives an impression; after which the workman takes it off, and applies another sheet; and in the mean time the letter on the surface of A passes round against the surface of B, and receives ink during the rotation of B. The distributing-rollers CC, do their office as in the machine fig. 1.; and once in every revolution the tail F, affixed to B, raises the inking-piece G, so as to cause it to touch one of the distributing-rollers, and supply it with ink. In this way therefore the repeated printing of sheet after sheet goes on.

Fig. 5. is a printing press more particularly adapted to print cottons, silks, paper-hangings, or other articles which run of a considerable length. A is a cylinder covered with woollen cloth, or other soft substance. The web or piece of cotton, or other goods, is passed round this cylinder, from the carrying-roller F to the receiving-rollers GH; which are connected by a piece of linen, woollen, or hair-cloth, in the manner of a jack-towel, sewed round them; the rotation of this towel carries away the printed stuff or goods, and deposits them at L. KL is a moveable box, containing three rollers, which move against each other in rotation. The lowest roller C revolves in a mass of colour, contained in a trough or vessel in the bottom part of the box KL; the surface of this colour is represented by the line MN. The next roller B is stuffed and covered as described in section 2. The pressure of B against C prevents the cylinder B from receiving too much colour. D is a cut or carved cylinder, which receives colour, during the rotation, from the roller B, and impresses it upon the web as it passes round the cylinder A; in this way the constant and effectual action of the machine is sufficiently obvious. It must be observed, that the cylinders ADB and G are connected together by cog-wheels, straps, or other well-known equivalent contrivances; so that the handle P drives the whole, without their necessarily depending on any adhesion or friction at their surfaces. The pressure of B against D is governed by an adjustment of the axis of D, whose

sockets are capable of a small motion; and the pressure of D against A is governed by the position of the whole box KL. When it is required to print more than one colour upon the same piece, it must pass two or more times through the machine; or, in those cases where the materials are liable to change their dimensions, it is necessary to apply, at one and the same time, two or more such boxes as KL, with their respective cylinders, so that the pattern cylinder of each may make its impression upon the web or material to be printed on.

Fig. 6. is a printing-press, chiefly of use for books and papers. 1, 2, 3, 4, represent a long table with ledgers on each side; so that the two cylinders A and B can run backwards and forwards without any side shake. In one of these ledges is placed a strip or plate of metal cut into teeth, which lock into corresponding teeth in each cylinder; by which means the two cylinders roll along, without the possibility of changing the relative positions of their surfaces at any determinate part of the table. This may also be effected by straps, and may indeed be accomplished, with tolerable accuracy, by the mere rolling of the cylinders on the smooth or flat ledges without any provision. A is the printing-cylinder, covered with woollen cloth, and B is the inking-cylinder, with its distributing-rollers. The table may be divided into four compartments, marked with a thicker bounding line than the rest, and numbered 1, 2, 3, 4. At 1 is placed a sheet of paper; at 2 is the form or chase, containing letter set and imposed; at 3 is an apparatus for receiving the printed sheet; and 4 is employed in no other use than as a place of standing for the carriage E, after it has passed through one operation, and when it takes ink at F. Its action is as follows: the carriage is thrust forward by the workman, and as the roller A passes over the space numbered 1, it takes up the sheet of paper previously laid there, while the roller B runs over the form and inks the letter. The sheet of paper being wrapped round the cylinder A, is pressed against the form as that cylinder proceeds, and consequently it receives an impression. When A arrives at the space numbered 3, it lets go the sheet of paper, while the prominent part of the carriage G strikes the lever P, and raises the inking-piece, which applies itself against one of the distributing rollers. In this manner therefore the cylinder A returns empty, and the cylinder B inked, and in the mean time the workman places another sheet of paper ready in the space numbered 1. Thus it is that the operation proceeds in the printing of one sheet after another.

The preceding description is not encumbered with an account of the apparatus by which the paper is taken up and laid down. This may be done in several ways: Figs. 11. and 12. represent one of the methods. DE is a lever, moving on the centre pin C, and having its end D pressed upwards by the action of the spring G. The shoulder which contains the pin C is fixed in another piece F, which is inserted in a groove in the surface of the cylinder A (fig. 6.), so that it is capable of moving in and out, in a direction parallel to the axis of that cylinder. As that cylinder proceeds, it meets a pin in the table; which (letter P, fig. 11.) acting on the inclined plane at the other end of the lever, throws the whole inwards, in the position represented in fig. 12.; in which case the extremity D shoots inwards, and applies itself against the side of the cylinder.

In fig. 13. is a representation of part of the

## PRINTING.

table; the dotted square represents a sheet of paper, and the four small shaped squares denote holes in the board, with pins standing beside them. When the lever DE (fig. 12.) shoots forward, it is situated in one of these holes, and advances under the edge of the paper, which consequently it presses and retains against the cylinder with its extremity D. Nothing more remains to be said respecting the taking up, but that the cylinder is provided with two pair of these clasps or levers, which are so fixed as to correspond with four holes represented in fig. 13. It will be easy to understand how the paper is deposited in the compartment N° 3. (fig. 6.). A pin P (fig. 12.) rising out of the platform or table, acts against a pin E, projecting sidewise out of the lever, and must of course draw the slider and its lever to the original position; the paper consequently will be let go, and its disengagement is rendered certain by an apparatus fixed in the compartment numbered 3. (fig. 6.) of exactly the same kind as that upon the cylinder, and which, by the action of a pin duly placed in the surface of the cylinder A, takes the paper from the cylinder in precisely the same manner as that cylinder originally took it up in the compartment numbered 1 (fig. 6.).

Figs. 7, 8, and 9, represent a simpler apparatus for accomplishing the same purpose. If, A a B b (fig. 9.) be supposed to represent a thick plate of metal of a circular form, with two pins, A and B, proceeding sidewise or perpendicularly out of its plane, and diametrically opposite to each other, and G another pin proceeding in the direction of that plane, then it is obvious that any force applied to the pin A so as to press it into the position *a* (by turning the plate on its axis or centre X), will at the same time cause the pin G to acquire the position *g*; and, on the other hand, when B is at *b*, or the dotted representation of the side pin, if any pressure be applied to restore its original position at B, the pin *g* will return back to G. Now the figures 7 and 8 exhibit an apparatus of this kind, applied to the cylinder A; and that cylinder, by rolling over the pins P and *p*, properly fixed in the table to re-act upon the apparatus, will cause its prominent part G either to apply to the cylinder and clasp the paper, or to rise up and let it go. The compartment numbered 3 (fig. 6.) must of course have an apparatus of the same kind to be acted upon by pins from A, in order that it may take the paper from that cylinder.

There is one other circumstance belonging to this machine which remains to be explained. When the carriage E (fig. 6.) goes out in the direction of the numbers 1, 2, 3, 4, both rollers, A and B, press the form of letter in their passage; but in their return back again the roller A, having no paper upon it, would itself become soiled, by taking a faint impression from the letter, if it were not prevented from touching it: the manner of effecting this may be understood from fig. 14. The apparatus there represented is fixed upon the outside of the carriage E, near the lower corner, in the vicinity of the roller A; the whole of this projects sidewise beyond the ledge of the table, except the small truck or wheel B. The irregularly-triangular piece, which is shaded by the stroke of the pen, carries this wheel, and also a catch moveable on the axis or pin E. The whole piece is moveable on the pin A which connects it to the carriage. CD, or the part which is shaded by dotting, is a detent, which serves to hold the piece down in a certain position. It may be observed, that both

the detent and the triangular piece are furnished each with a claw, which holds in one direction, but trips or yields in the other, like the jacks of a harpsichord, or resembling certain pieces used in clock and watch making, as is clearly represented in the figure. These claws overhang the side of the table, and their effect is as follows: There is a pin C (fig. 6.) between the compartments of the table numbered 2 and 3, but which is marked F in fig. 14. where GH represents the table. In the outward run of the carriage these claws strike that pin, but with no other effect than that they yield for an instant, and as instantly resume their original position by the action of their respective slender back-springs. When the carriage returns, the claw of the detent indeed strikes the pin, but with as little effect as before, because its derangement is instantly removed by the action of the back spring of the detent itself; but, when the claw of the triangular piece takes the pin, the whole piece is made to revolve on its axis or pin A, the wheel B is forced down, so as to lift that end of the carriage, and the detent, catching on the piece at C, prevents the former position from being recovered. The consequence of this is, that the carriage runs upon the truck B (and its correspondent truck on the opposite side) instead of the cylinder A, which is too much raised to take the letter, and soil itself; but as soon as the end of the carriage has passed clear of the letter, another pin R (fig. 6.) takes the claw of the detent, and draws it off the triangular piece; at which instant the cylinder A subsides to its usual place and performs its functions as before. This last pin R does not affect the claw of the triangular piece, because it is placed too low; and the claw of the detent is made the longest, on purpose that it may strike this pin.

Fig. 10. represents an instrument for printing floor-cloths, paper-hangings and the like, with stiff paint and a brush. D is a copper or metallic cylinder fixed in a frame A, like a garden-roller; its carved part is thin, and is cut through in various places, according to the desired pattern. A strong axis passes through the cylinder, and its extremities are firmly attached to the frame A. To this axis is fixed a vessel or box of the same kind, and answering the same purpose as the box KL in fig. 5. It carries a cylinder P, which revolves in the colour; another cylinder E, which revolves in contact with P: and a third cylinder B, whose exterior surface is covered with hair, after the manner of a brush, and revolves in contact with E. This cylinder B is adjusted by its axis in such a manner that its brush-part sweeps in the perforated parts of the metallic cylinder D. The circle C represents a cog-wheel fixed concentric to the cylinder D, and revolving with it; this wheel takes another wheel concentric to, and fixed to, B; hence the action is as follows: When the metallic cylinder is wheeled or rolled along any surface, its cog-wheel C drives the brush B in the contrary direction; and this brush cylinder being connected by cogs or otherwise with E and P, causes those also to revolve and supply it with colour. As the successive openings of the cylinder D, therefore, come in contact with the ground, the several parts of the brush will traverse the uncovered part of that ground, and paint the pattern upon it. The wheel G, being kept lightly on the ground, serves to determine the line of contact, that it shall be the part opposite to B, and no other.

It has always been justly reckoned a desirable





*The Stanhope Press.*

8.  
der  
1786.

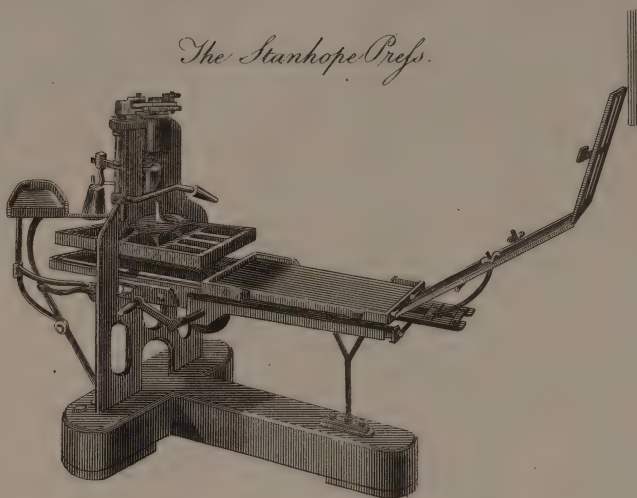


*Fig. 2.*

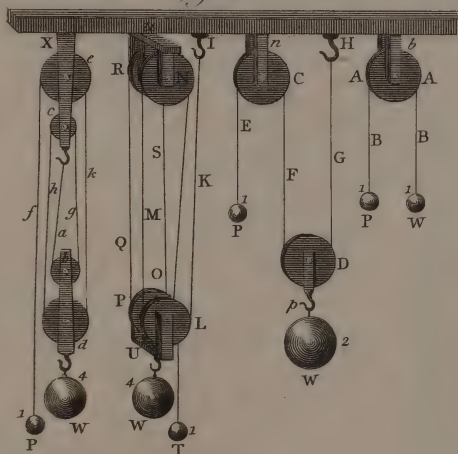
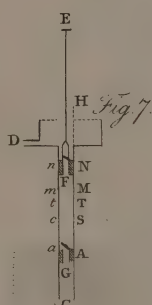
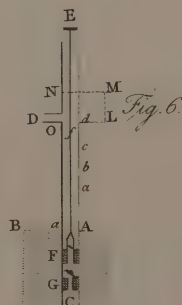
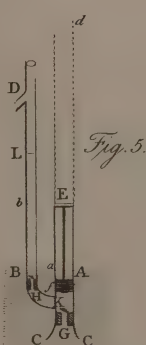
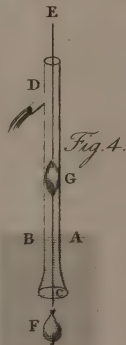
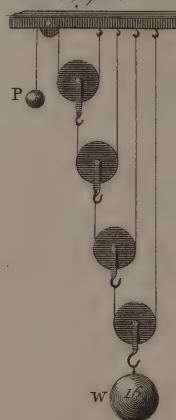


*Fig. 3.*







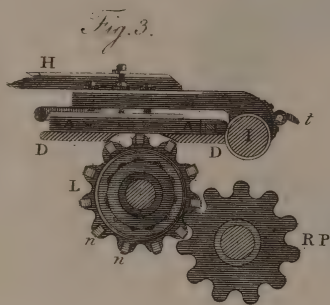
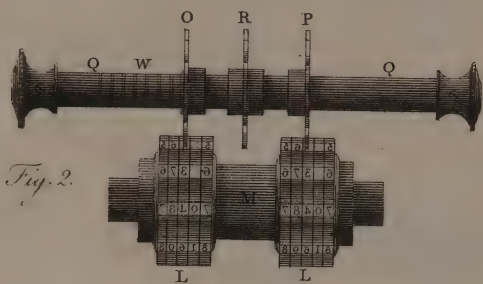
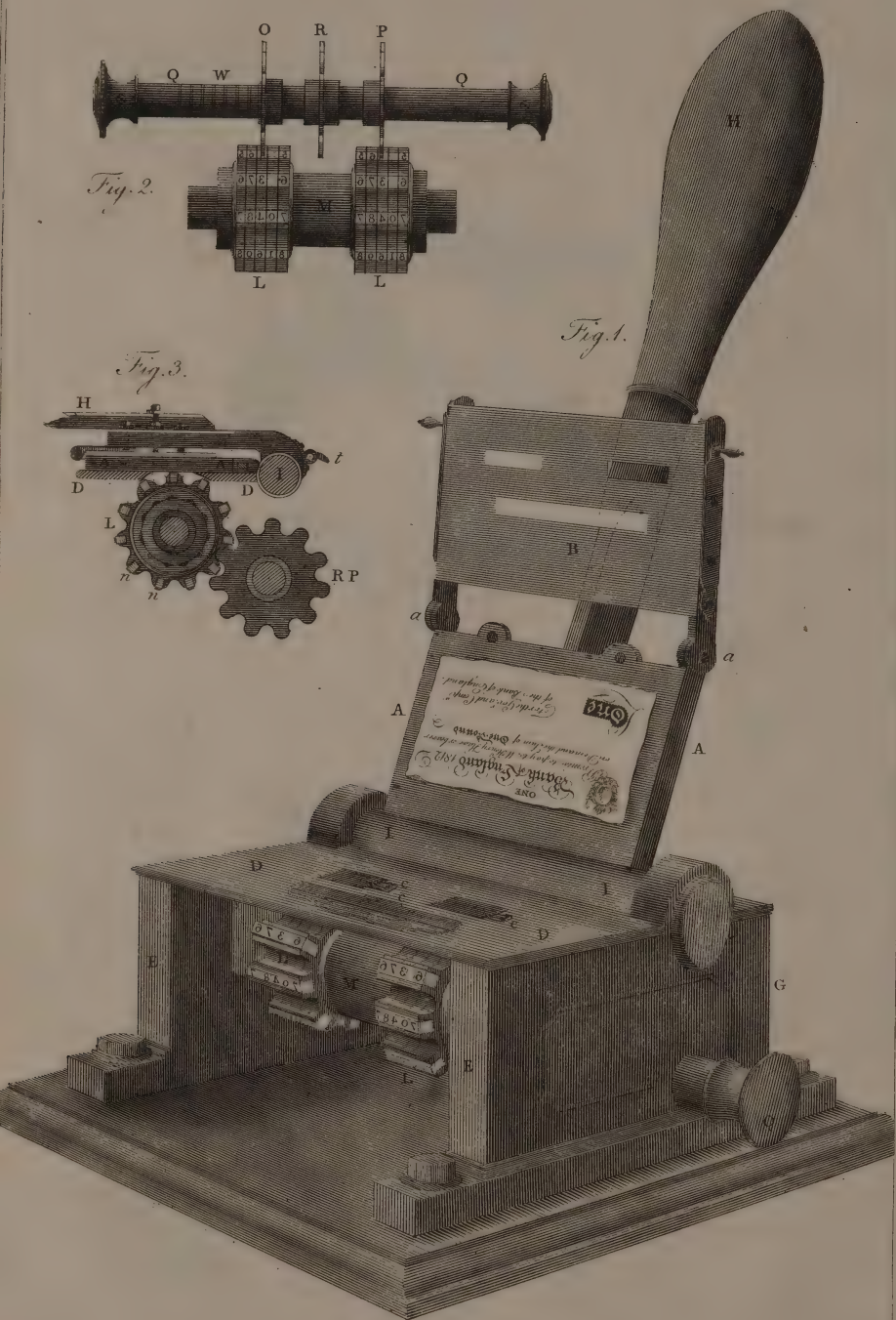


Fig. 1.





# PRINTING.

object to obtain an accession of power in the printing press, and at the same time a diminution of labour, and an equable application of force. This is in great measure accomplished by the press invented by earl Stanhope, and of which we have given an elevation in the upper part of pl. 145. In the common press, the perfect plane in the table and platten has long been a desideratum, which in the Stanhope press is completely supplied. Here the cheeks, the cap, and the winter, of the old press, are not required. In this press the platten is fixed to the hose, or apparatus, through which the screw works: and it is suspended to the short arm by a lever, provided with a counterbalancing weight, by which the form is released from the platten, at the return of the bar after the pull. For the stone is substituted a cast iron block which has its upper surface made accurately flat, and is laid correctly horizontal; this, with the provision made for a vertical pressure on the platten, and the care taken to set its lower face parallel to the surface of the block, ensures a uniform pressure on the form. For a minute description of this ingenious press, illustrated by drawings of the minutest parts, we beg to refer the reader to Mr. Stower's interesting work, the *Printer's Grammar*, where also may be seen a perspicuous account of another printing press, invented by Mr. Brooke.

**PRINTING PRESS for copper plate printing**, or, as it is usually termed, for *rolling press printing*, is employed in taking off prints or impressions from copperplates engraved, etched, or scraped, as in mezzotintos. See **ENGRAVING**.

This art is said to have been as ancient as the year 1540, and to owe its origin to Finiguerra, a Florentine goldsmith, who pouring some melted brimstone on an engraved plate, found the exact impression of the engraving left in the cold brimstone, marked with black taken out of the strokes by the liquid sulphur: upon this, he attempted to do the same on silver plates with wet paper, by rolling it smoothly with a roller; and this succeeded; but this art was not used in England till the reign of king James I. when it was brought from Antwerp by Speld. The form of the rolling-press, the composition of the ink used therein, and the manner of applying both in taking off prints, are as follows:

The rolling-press AL, fig. 15. pl. 144. may be divided into two parts, the body and carriage: the body consists of two wooden cheeks PP, placed perpendicularly on a stand or foot LM, which sustains the whole press. From the foot likewise are four other perpendicular pieces, *c, c, c, c*, joined by other cross or horizontal ones, *d, d, d*, which serve to sustain a smooth even plank or table HK, about four feet and a half long, two feet and a half broad, and an inch and a half thick. Into the cheeks go two wooden cylinders or rollers, DE, FG, about six inches in diameter, borne up at each end by the cheeks, whose ends, which are lessened to about two inches diameter, and called trunnions, turn in the cheeks about two pieces of wood in form of half-moons, lined with polished iron to facilitate the motion. Lastly, to one of the trunnions of the upper roller is fastened a cross, consisting of two levers AB, or pieces of wood, traversing each other, the arms of which cross serve instead of the bar or handle of the letter-press, by turning the upper roller, and when the plank is between the two rollers, giving the same motion to the under one, by drawing the plank forward and backward.

The ink used for copperplates is a composition made of the stones of peaches and apricots, the bones of sheep and ivory, all well burnt, and called Frankfort black, mixed with nut-oil that has been well boiled, and ground together on a marble, after the same manner as painters do their colours.

The method of printing from copperplates is as follows: They take a small quantity of this ink on a rubber made of linen-rags, strongly bound about each other, and therewith smear the whole face of the plate as it lies on a grate over a charcoal fire. The plate being sufficiently inked, they first wipe it over with a foul rag, then with the palm of their left hand, and then with that of the right; and to dry the hand and forward the wiping, they rub it from time to time in whitening. In wiping the plate perfectly clean, yet without taking the ink out of the engraving, the address of the workman consists. The plate thus prepared, is laid on the plank of the press; over the plate is laid the paper, first well moistened, to receive the impression; and over the paper two or three folds of flannel. Things thus disposed, the arms of the cross are pulled, and by that means the plate with its furniture passed through between the rollers, which pinching very strongly, yet equally, press the moistened paper into the strokes of the engraving, whence it licks out the ink.

**PRINTING MACHINE for numbering bank notes.** This is a most ingenious invention of Mr. Bramah's, recently adopted by the bank of England, for filling up the dates and numbers of their notes; which when printed from the copperplates have blanks left for the dates and numbers. These were formerly inserted in writing, for each note being different, in these particulars, did not admit of being printed, until Mr. Bramah produced his machine, which is a small printing press, provided with such mechanism as to change its types every time after an impression has been taken. Thus after having printed the note No. 1. it will at the next impression which is made have its type changed to No. 2, and so on.

Plate 143. contains a drawing of this machine; fig. 1. shewing it in perspective, as it appears with a bank note in it, prepared for having the numbers printed thereon. The note is placed against a flat tablet of brass, AA, its situation being determined by two fine pins fixed in the table, which are made to penetrate the paper at two small dots, printed upon it by the copper plate which printed the words of the note, as shown in the drawing; and it is confined in its position against the tablet by a piece of vellum B, stretched in a brass frame, connected by hinges *a a* to the tablet AA on which it folds down, enclosing the note as it were in a book: the vellum has openings cut through it, at the places where the machine is to print upon the note. These are, the number twice repeated, which is to be printed first in large characters over the words of the first line *I promise*, and again over the words *or bearer*, at the end of the first line; as for instance

N<sup>o</sup> 70486

N<sup>o</sup> 70480

1812 Jan<sup>y</sup>. 10. London 10 Jan<sup>y</sup>. 1812

The types for printing these words are fixed so as to project a little above the surface of a flat brass plate DD, forming the lid of an iron box

FFG, containing the mechanism; by which the types for the figures are shifted every time after an impression has been taken from them; which is done by bringing the flat table A having the note attached to it, down upon the types (previously inked) by the handle H, which, as well as the tablet, moves on an axis II, supported in two ears projecting from the sides of the iron box. The tablet is attached to this axis by means of screws (as shewn in fig. 3.), which admit of adjusting it in any direction so that it will fall perfectly flat upon the type, and print with equal pressure in all parts of the note. An impression being thus taken, on lifting up the handle H to take out the note, the types of the number are shifted by the mechanism in order to print the succeeding number. To explain the manner of effecting this we must refer to fig. 2, which is a plan of the wheelwork contained in the box detached from the frame. Here LL are two clusters of brass circles, consisting of 5 in each, placed close together, and connected by a strong spindle M passing through the centres of them all, and upon which they all revolve freely. Each circle, as shewn in fig. 3. has its circumference divided into 11 cogs, and in each cog a space is cut to receive a type *n n*, which are arranged round the cogs in a series of 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, and a blank; and as the circles turn round independent of each other, any combination of figures may be made by them, which is less than No. 99,999, beyond which number the bank notes have not extended. The circles are turned round on their central axis by means of wheels OP fixed on an axis Q Q, extending across the frame of the machine. These wheels have 11 teeth, which operate between the teeth of the circle L as shewn in fig. 3 to turn them round, but without touching the types. The axis Q receives its motion by means of a wheel R, similar to O and P, fixed upon the middle of it, which is acted upon by a detent I, fig. 3. moving with the axis I, which every time the handle is raised up into the position of the view fig. 1, intercepts a tooth of the wheel R and moves it forwards. This by the same movement advances the circles L one tooth, and brings up a succeeding type through the aperture in the brass plate D. The wheels upon the axis Q are so narrow upon the edge as to engage only one of the circles L at the same time, and are at such a distance asunder upon their axis as to engage the same circle of each cluster at one time: the axis can be shifted endways in its bearings to operate with any one of the five circles in each cluster, and can be retained, in any position, by a semicircular clip, which enters into circular grooves formed round the spindle, of which there are 5 (as W, fig. 1.), one corresponding with each of the circles. The shifting is performed by a knob at the end of the spindle, as shewn at Q, fig. 1.

The circles have all a tendency to assume the position in which the types are proper for printing, that is, with their upper surface parallel to the brass plate D, by means of a small pin fitted into the axis M, and having a constant pressure outwards by a spiral spring. This pin comes to rest in an angular notch, made within side the circle opposite each type, as shown by the dark shaded parts in fig. 3; and each circle is provided with one.

The machine is used in this manner: suppose the circles turned round to set their types so that all the blanks are upwards, except the first circle at the right hand side of each cluster. These present the figure 1: the type for No. and the date, being

cast in stereotype, are pinned down upon the brass plate D at c, c, and the date piece is changed every day. The spindle of Q is set for its wheels to work in the teeth of these right hand circles. A note is now put on the tablet, the types inked with a printer's ball, and an impression taken; in lifting up the handle, the detent I at the back of its axis seizes a tooth of the wheel R, and by turning it round advances the two right hand circles of each cluster, so as to bring up No. 2. Another note is now printed, then No. 3 and so on, till No. 9 is printed, and 0 brought up, after which the handle is brought down twice, without printing any note. This brings up the blank space and No. 1. The axis is now shifted by its knob Q, fig. 1. to act upon the second circle from the right hand, and one motion of the handle being made brings up 0 of the second circle, making 01 <sup>N</sup> which when printed (types being always in reverse) will be No. 10. The first circle which before was units is now become tens, and the second units, which shifts at every impression to 11, 12, &c. up to 19, and after printing this the 0 comes up, making 10. The first circle is then pushed forwards by the printer with a small wooden skewer, and 2 in the first circle brought up, making 20. In this manner it proceeds to 99, the machine altering itself at every unit, but requires to be set by hand to advance for every ten. When 100 is to be printed, the axis is shifted to the 3d circle which becomes units, the 2d tens, and the first hundreds. The printing then proceeds as before, the units being advanced by the machine, but the tens and hundreds as often as they require it being advanced by hand. At 1000 the axis is shifted to the 4th circle, and the denomination of each is changed by this becoming the unit; 3 circles must now be moved by hand. On arriving at 10,000 the 5th circle must be made unit by shifting the axis to it, and the 4 first are moved when necessary by hand: and in this manner the machine will print up to 99,999, which is 100,000 wanting 1.

The machines in actual use at the bank of England, which are 40 in number, differ from our drawing in having two systems of circles, and a tablet of double length, for printing two notes at the same time; because the copper plates are of double size, and print two notes at once on the same paper, which is afterwards cut in two.

By these machines the labour of filling up the notes is reduced to less than  $\frac{1}{4}$  of what it was before their introduction, when one clerk was expected to fill up in writing 400 notes per day, whereas by one of the machines he can print 1300 double notes, which is equal to 2600 single ones.

**PRINTLESS.** *a.* (from *print.*) That leaves no impression (*Milton*).

**PRIONUS**, in the entomology of Fabricius, a tribe of the coleopterous genus *CERAMBYX*, which see.

**PRIOR.** *a.* (*prior*, Lat.) Former; being before something else; antecedent; anterior.

**PRIOR.** *s.* (*prieur*, French.) The head of a convent of monks, inferior in dignity to an abbot (*Addison*).

**PRIOR ANNULARIS.** (*musculus prior annularis*.) In anatomy. An internal interosseous muscle of the hand. See *INTEROSSEI MANUS*.



**PRIOR INDICIS.** (*musculus prior medii.*) Extensor tertii internodii indicis of Douglas: An internal interosseal muscle of the hand, which draws the fore finger inwards towards the thumb, and extends it obliquely.

**P. MEDII.** (*Musculus prior medii.*) An extensor interosseus muscle of the hand. See **INTEROSSEI MANUS.**

**PRIOR** (Matthew), an elegant and celebrated English poet, was the son of Mr. George Prior, a citizen and joiner of London, where he was born in 1664. His father dying while he was young, he was left to the care of his uncle, a vintner, who behaved to him with the tenderness of a parent. He had him educated at Westminster-school, after which he took him home, intending to bring him up to his own business. But he still prosecuted the study of the classics at his leisure hours, and particularly his favourite, Horace; by which means he was soon taken notice of by the polite company who resorted to his uncle's house. One day, as the earl of Dorset, with several other persons of rank, were at this tavern, the discourse turned upon the Odes of Horace, and the company being divided in their opinions about a passage in that poet, one of the gentlemen said, "We are not like to agree in our criticisms, but if I am not mistaken, there is a young fellow in the house who is able to set us all right:" upon which he named Mr. Prior, who was immediately sent for, and desired to give his opinion of Horace's meaning in the ode under debate. This he did with great modesty, and so much to the satisfaction of the company, that the earl of Dorset determined to remove him to a more agreeable station; and accordingly had him sent to St. John's college in Cambridge, where he at length became fellow of that college. He there contracted an intimate friendship with Charles Montague, afterwards earl of Halifax, in conjunction with whom he wrote a very humorous piece, intitled the Hind and the Panther transversed to the story of the Country Mouse and City Mouse, in answer to Mr. Dryden's poem called the Hind and Panther. Upon the revolution, Mr. Prior was brought to court by the earl of Dorset, and in 1690 was made secretary to the earl of Berkeley, plenipotentiary for king William and queen Mary, at the congress at the Hague; and afterwards appointed secretary to the earls of Pembroke and Jersey, and sir William Williamson, ambassadors and plenipotentiaries at the treaty of Ryswick in 1697; as he was likewise in 1698 to the earl of Portland, ambassador to the court of France. While he was in that kingdom, one of the officers of the French king's household, shewing him the royal apartments at Versailles, and particularly the paintings of Le Brun, in which are represented the victories of Lewis XIV. asked him whether king William's actions were also to be seen in his palace? "No, Sir," answered Mr. Prior, "the monuments of my master's actions are to be seen every where but in his own house." In 1697 he was made secretary of state for Ireland, and in 1700 was ap-

pointed one of the lords commissioners of trade and plantations, and was chosen member of parliament for East Grinstead in Sussex. In 1711 he was made one of the commissioners of customs, and sent minister plenipotentiary into France, for negotiating a peace with that kingdom: but the year after Geo. I. came to the throne he was recalled from France, and upon his arrival was taken up by a warrant from the house of commons, and soon after strictly examined by a committee of the privy-council. Robert Walpole, esq. then moved the house of commons for an impeachment against him, and he was ordered into custody: but though he was one of the persons excepted out of the act of grace which passed in 1717, he was at the close of that year discharged from his confinement; upon which he spent the remainder of his days in tranquillity and retirement, chiefly at his estate at Downhall in Essex. He died at the earl of Oxford's seat at Wimpole in Cambridgeshire, the 18th of September, 1721, and was interred in Westminster abbey, where a monument is erected to his memory. The following is the epitaph he wrote for himself:

"Nobles and heralds, by your leave,  
Here lie the bones of Matthew Prior,  
The son of Adam and of Eve:  
Let Bourbon or Nassau go higher."

**PRIORIES** (Alien), were cells of religious houses in England which belonged to foreign monasteries: for when manors or tithes were given to foreign convents, the monks, either to increase their own rule, or rather to have faithful stewards of their revenues, built a small convent here for the reception of such a number as they thought proper, and constituted priors over them. Within these cells there was the same distinction as in those priories which were cells subordinate to some great abbey; some of these were conventual, and, having priors of their own choosing, thereby became entire societies within themselves, and received the revenues belonging to their several houses for their own use and benefit, paying only the ancient apport, acknowledgment, or obvention, at first the surpluseage, to the foreign house; but others depended entirely on the foreign houses, who appointed and removed their priors at pleasure. These transmitted all their revenues to the foreign head houses; for which reason their estates were generally seized to carry on the wars between England and France, and restored to them again on return of peace. These alien priories were most of them founded by such as had foreign abbeys founded by themselves or by some of their family.

The whole number is not exactly ascertained; the Monasticon has given a list of 100: Weever, p. 338, says 110.

They were all dissolved by act of parliament 2 Henry V. and all their estates vested in the crown, except some lands granted to the college of Fotheringhay. The act of dissolution is not printed in the statute books, but it is to

be found entire in Rymer's *Fœdera*, ix. 283. and in the *Parliament Rolls*, vol. iv. p. 22. In general, these lands were appropriated to religious uses. Henry VI. endowed his foundations at Eton and Cambridge with the lands of the alien priories, in pursuance of his father's design to appropriate them all to a noble college at Oxford. Others were granted in fee to the prelates, nobility, or private persons. Such as remained in the crown were granted by Henry VI. 1440, to archbishop Chicheley, &c. and they became part of his and the royal foundations.

**PRI/ORESS.** *s.* (from *prior*.) A lady superior of a convent of nuns.

**PRI/ORITY.** *s.* (from *prior*, adjective.) 1. The state of being first; precedence in time (*Hayward*). 2. Precedence in place (*Shak.*).

**PRI/ORSHIP.** *s.* (from *prior*.) The state or office of prior.

**PRI/ORY.** *s.* (from *prior*.) A covenant in dignity below an abbey (*Shakspeare*).

**PRISAGE.** *s.* (from *prise*.) A custom, now called butlerage, whereby the prince challenges out of every bark laden with wine, two tuns of wine at his price (*Cowell*).

**PRISCIANUS**, an eminent grammarian of Cæsarea, flourished at Constantinople about 525. Laurentius Valla calls Priscian, Donatus, and Servius, the "triumviri in grammatica;" and a person who writes false Latin is proverbially said "to break Priscian's head."

**PRISM**, in geometry, is a body, or solid, whose two ends are any plain figures which are parallel, equal, and similar; and its sides connecting those ends, are parallelograms. Hence, every section parallel to the ends, is the same kind of equal and similar figure as the ends themselves are; and the prism may be considered as generated by the parallel motion of this plane figure.

Prisms take their several particular names from the figure of their ends. Thus, when the end is a triangle, it is a triangular prism; when a square, a square prism; when a pentagon, a pentagonal prism; when a hexagon, a hexagonal prism; and so on. And hence the denomination prism comprises also the cube and parallelopipedon, the former being a square prism, and the latter a rectangular one. And even a cylinder may be considered as a round prism, or one that has an infinite number of sides. Also a prism is said to be regular or irregular according as the figure of its end is a regular or an irregular polygon.

The axis of a prism, is the line conceived to be drawn lengthways through the middle of it, connecting the centre of one end with that of the other end.

Prisms, again, are either right or oblique.

A right prism is that whose sides, and its axis, are perpendicular to its ends; like an upright tower. And

An oblique prism, is when the axis and sides are oblique to the ends; so that, when set upon one end, it inclines on one hand, like an inclined tower.

The principal properties of prisms are,

1. That all prisms are to one another in the ratio compounded of their bases and heights.

2. Similar prisms are to one another in the triplicate ratio of their like sides.

3. A prism is triple of a pyramid of equal base and height; and the solid content of a prism is found by multiplying the base by the perpendicular height.

4. The upright surface of a right prism is equal to a rectangle of the same height, and its breadth equal to the perimeter of the base or end. And therefore such upright surface of a right prism is found by multiplying the perimeter of the base by the perpendicular height. Also the upright surface of an oblique prism is found by computing those of all its parallelogram sides separately, and adding them together.

And if to the upright surface be added the areas of the two ends, the sum will be the whole surface of the prism.

**PRISM**, in dioptrics, is a piece of glass in form of a triangular prism: which is much used in experiments concerning the nature of light and colours. See **COLOUR**.

**PRISMATIC.** *a.* (*prismatique*, Fr. from *prism*.) Formed as a prism (*Pope*).

**PRISMATICALLY.** *ad.* (from *prismatic*.) In the form of a prism (*Boyle*).

**PRISMOID.** *s.* (*πρισμαειδης* and *ειδος*.) A body approaching to the form of a prism, having its ends parallel but unlike plane figures of the same number of sides.

**PRISON**, a gaol, or place of confinement. See **GAOL**. Lord Coke observes, that a prison is only a place of safe custody, *salva custodia*, not a place of punishment. Any place where a person is confined may be said to be a prison: and when a process is issued against one, he must, when arrested thereon, either be committed to prison, or be bound in a recognizance with sureties, or else give bail, according to the nature of the case, to appear at a certain day in court, there to make answer to what is alleged against him. When a person is taken and sent to prison in a civil case, he may be released by the plaintiff in the suit; but if it is for treason or felony, he may not regularly be discharged until he is indicted of the fact and acquitted.

The good policy of imprisonment for debt has been frequently called in question (probably by those who were most in danger of suffering from it). We are of opinion, however, that it is in the whole productive of salutary consequences in a state, and the terror of a gaol is in many cases an useful moral restraint. The following paper, however, set forth by the laudable society for the discharge and relief of persons imprisoned for small debts, will excite various reflections in different readers; and without any comment we submit it as a curious document to the statesman, or political arithmetician, as throwing some light on the manners and character of the age.

The following is a summary view of the money annually expended by the society for the



discharge and relief of persons imprisoned for small debts, Craven-street, Strand, from the institution in 1772, to the 31st of March 1804.

| 1772 No. of debtors discharged to and relieved. |                     | Expended. |       |
|-------------------------------------------------|---------------------|-----------|-------|
|                                                 |                     | £.        | s. d. |
| 1774                                            | 1772 for the sum of | 4622      | 17 1  |
| 1775                                            | 966                 | 1724      | 1 11  |
| 1776                                            | 673                 | 1842      | 13 3  |
| 1777                                            | 877                 | 1729      | 19 7  |
| 1778                                            | 779                 | 1764      | 0 11  |
| 1779                                            | 811                 | 1611      | 15 3  |
| 1780                                            | 628                 | 1288      | 17 1  |
| 1781                                            | 321                 | 828       | 15 9  |
| 1782                                            | 389                 | 935       | 3 9   |
| 1783                                            | 547                 | 1121      | 12 0  |
| 1784                                            | 535                 | 996       | 12 3  |
| 1785                                            | 463                 | 904       | 9 1   |
| 1786                                            | 339                 | 715       | 8 9   |
| 1787                                            | 343                 | 719       | 9 10  |
| 1788                                            | 710                 | 1566      | 4 2½  |
| 1789                                            | 612                 | 1926      | 3 3½  |
| 1790                                            | 798                 | 2303      | 9 3   |
| 1791                                            | 666                 | 1777      | 0 6   |
| 1792                                            | 460                 | 1297      | 14 7  |
| 1793                                            | 568                 | 1870      | 1 5   |
| 1794                                            | 540                 | 1844      | 14 9½ |
| 1795                                            | 434                 | 1438      | 6 1   |
| 1796                                            | 481                 | 1756      | 0 5   |
| 1797                                            | 490                 | 1606      | 15 0  |
| 1798                                            | 645                 | 2001      | 13 6  |
| 1799                                            | 578                 | 1553      | 14 5  |
| 1800                                            | 648                 | 2106      | 16 10 |
| 1801                                            | 1885                | 2870      | 4 4   |
| 1802                                            | 1125                | 2607      | 11 1  |
| 1803                                            | 927                 | 2892      | 14 0  |
| 1804                                            | 916                 | 2586      | 2 1   |

20,906 debtors, who had 69,115 persons immediately benefited for 547811. 3s. 5½d.

The average for the debts of the above 20,906 debtors is 2l. 12s. 4½d. each, and for each individual relieved 15s. 1d.

**TO PRISON.** *v. a.* (from the noun.) 1. To imprison; to shut up in hold; to restrain from liberty. 2. To captivate; to enchain (*Milton*). 3. To confine (*Shakspeare*).

**PRISONBASE.** *s.* A kind of rural play, commonly called *prisonbars* (*Sandys*).

**PRISONER.** *s.* (*prisonnier*, French.) 1. One who is confined in hold (*Bacon*). 2. A captive; one taken by the enemy (*Bacon*). 3. One under an arrest (*Dryden*).

**PRISONHOUSE.** *s.* Gaol; hold in which one is confined (*Shakspeare*).

**PRISONMENT.** *s.* (from *prison*.) Confinement; imprisonment; captivity (*Shaks.*).

**PRISRENDI**, a town of European Turkey, in Servia, and a bishop's see, with a magnificent church. It is seated on the Drin, 170 miles S. of Belgrade. Lon. 21. 3 E. Lat. 42. 20 N.

**PRISTINA**, a town of European Turkey, in Servia, which was pillaged by the Austrians in 1689. It is seated on the Rusca, 150 miles S. by E. of Belgrade. Lon. 21. 36 E. Lat. 42. 43 N.

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**PRISTINE.** *a.* (*pristinus*, Lat.) First; ancient; original (*Phillips*).

**PRISTIS**, the name of one of the ships that engaged in the naval combat which was exhibited by Æneas at the anniversary of his father's death. She was commanded by Mnestheus.

**PRISTIS.** Saw-fish. In zoology, a genus of the class pisces, order chondroptergia. Snout long, flat, spinous down the edges; spiracles from four to five, lateral; body oblong, roundish, covered with a rough coriaceous skin; mouth beneath; nostrils before the mouth, half covered with a membranaceous flap; behind the eyes two oval orifices; ventral fins approximate; no anal fin. Five species, as follows.

1. *P. antiquorum*. Snout with from eighteen to twenty-four strong spines on each side; head flat on the fore-part; length of the snout five feet; teeth granulate; eyes large; iris golden; spiracles five; first dorsal fin opposite the ventral, second midway between the first and the tail; pectoral broad, long; caudal short. Inhabits the ocean; fifteen feet long; body above blackish, beneath whitish.

2. *P. pectinans*. Snout with from twenty-five to thirty-four narrower spines on each side. Inhabits the ocean; resembles the last, but the snout is narrower and slenderer; spines longer, slenderer.

3. *P. cuspidatus*. Snout with twenty-eight broad cuspidate spines on each side. The habitation of this is uncertain. A specimen of the snout was preserved in the Leverian Museum till its valuable articles were disposed of, the spines of which were as sharp at the point as a surgeon's lancet.

4. *P. microdon*. Spines on the snout small, hardly perforating the skin. Habitation, like that of the last, unknown; it is also described from a specimen in the Leverian Museum; twenty-eight inches long; snout ten inches; dorsal fins much hollowed out at the back-part.

5. *P. cirratus*. Snout cirrate in the middle; spines long, with intermediate shorter ones; the longer about twenty, sharp, and somewhat incurved; the shorter from three to six; about the middle of the snout on each side near the edge, a flexible appendage three inches and a half long, resembling the beards of the cod-fish; spiracles four; mouth with five rows of sharp minute teeth; tail lanceolate. Inhabits New Holland; about forty inches long; body pale-brown.

**PRITHEE.** A familiar corruption of *pray thee*, or *I pray thee* (*L'Estrange*).

**PRIVACY.** *s.* (from *private*.) 1. State of being secret; secrecy. 2. Retirement; retreat; place intended to be secret (*Dryden*). 3. (*privauté*, Fr.) Privity; joint knowledge; great familiarity. Improper use (*Arbuthnot*). 4. Taciturnity (*Ainsworth*).

**PRIVADO.** *s.* (Spanish.) A secret friend (*Bacon*).

**PRIVAS**, a town of France, capital of the department of Ardeche. It is seated on a hill,

near the confluence of three small rivers, 68 miles S. of Lyon. Lon. 4. 36 E. Lat. 44. 45 N.

**PRIVATE.** *a.* (*privatus*, Latin.) 1. Not open; secret (*Milton*). 2. Alone; not accompanied. 3. Being upon the same terms with the rest of the community; particular (*Hooker*). 4. Particular; not relating to the public (*Digby*). 5. *In PRIVATE*, Secretly; not publicly; not openly (*Granville*).

**PRIVATE.** *s.* A secret message (*Shakespeare*).

**PRIVATEERS**, are a kind of private men of war, the persons concerned wherein administer at their own costs a part of a war, by fitting out these ships of force, and providing them with all military stores; and they have, instead of pay, leave to keep what they take from the enemy, allowing the admiral his share, &c.

**TO PRIVATEER.** *v. a.* (from the noun.) To fit out ships against enemies, at the charge of private persons.

**PRIVATELY.** *ad.* (from *private*.) Secretly; not openly (*Shakespeare*).

**PRIVATENESS.** *s.* (from *private*.) 1. The state of a man in the same rank with the rest of the community. 2. Secrecy; privacy (*Bacon*). 3. Obscurity; retirement (*Watton*).

**PRIVATION.** *s.* (*privatio*, Latin.) 1. Removal or destruction of any thing or quality (*Davies*). 2. The act of the mind by which, in considering a subject, we separate it from any thing appendant. 3. The act of degrading from rank or office (*Bacon*).

**PRIVATIVE.** *a.* (*privativus*, Latin.) 1. Causing privation of any thing. 2. Consisting in the absence of something; not positive (*Taylor*).

**PRIVATIVE.** *s.* That of which the essence is the absence of something, as silence is only the absence of sound (*Bacon*).

**PRIVATIVE**, in grammar, a particle, which, prefixed to a word, changes it into a contrary sense.

Thus, among the Greeks, the *a* is used as a privative: as in *atheism*, atheist, acephalus, &c. The Latins have their privative in: as, *incomrigibilis*, *indeclinabilis*, &c. The English, French, &c. on occasion, borrow both the Latin and Greek privatives.

**PRIVATIVELY.** *ad.* (from *privative*.) 1. By the absence of something. 2. Negatively (*Hammond*).

**PRIVATIVENESS.** *s.* (from *privative*.) Notation of absence of something that should be present.

**PRIVET**, in botany. See **LIGUSTRUM**.

**PRIVET** (Mock). See **PHILLYREA**.

**PRIVILEGE.** *s.* (*privilege*, Fr. *privilegium*, Lat.) 1. Peculiar advantage (*Shakespeare*). 2. Immunity; right not universal (*Dryden*).

**PRIVILEGE**, in law, some peculiar benefit granted to certain persons or places, contrary to the usual course of the law.

Privileges are said to be personal or real. Personal privileges are such as are extended to peers, ambassadors, members of parliament

and of the convocation, and their mental servants, &c. A real privilege is that granted to some particular place; as the king's palace, the courts at Westminster, the universities, &c.

**TO PRIVILEGE.** *v. a.* (from the noun.) 1. To invest with rights or immunities; to grant a privilege (*Dryden*). 2. To exempt from censure or danger (*Sidney*). 3. To exempt from paying tax or impost (*Hale*).

**PRIVILY.** *ad.* (from *privy*.) Secretly; privately (*Spenser*).

**PRIVITY.** *s.* (*privauté*, Fr. from *privy*.) 1. Private communication (*Spenser*). 2. Consciousness; joint knowledge; private concurrence (*Hooker*). 3. (In the plural.) Secret parts (*Abbot*).

**PRIVY.** *a.* (*privé*, French.) 1. Private; not public; assigned to secret uses (*Shakespeare*). 2. Secret; clandestine (*Maccabees*). 3. Secret; not shown (*Ezekiel*). 4. Admitted to secrets of state (*Spectator*). 5. Conscious to any thing; admitted to participation of knowledge (*Daniel*).

**PRIVY.** *s.* Place of retirement; necessary house (*Swift*).

**PRIVY**, in law, denotes one who is partaker, or has an interest, in an affair.

**PRIVY COUNCIL**, is the principal council belonging to the king, and is generally called by way of eminence the council.

Privy counsellors are made by the king's nomination, without either patent or grant; and on taking the necessary oaths, they become immediately privy counsellors during the life of the king that chooses them, but subject to removal at his discretion. No inconvenience now arises from the extension of the number of the privy council, as those only attend who are especially summoned for that particular occasion.

The duty of a privy-counsellor appears from the oath of office, which consists of seven articles: 1. To advise the king according to the best of his cunning and discretion. 2. To advise for the king's honour and good of the public, without partiality, through affection, love, meed, doubt, or dread. 3. To keep the king's counsel secret. 4. To avoid corruption. 5. To help and strengthen the execution of what shall be there resolved. 6. To withstand all persons who would attempt the contrary. And, lastly, in general, 7. To observe, keep, and do all that a good and true counsellor ought to do to his sovereign lord.

The privy-council is the *primum mobile* of the state, and that which gives the motion and direction to all the inferior parts. It is likewise a court of justice of great antiquity; the primitive and ordinary way of government in England being by the king and privy-council. It has been frequently used by all our kings for determining controversies of great importance: the ordinary judges have sometimes declined giving judgment till they have consulted the king and privy-council; and the parliament have frequently referred matters of high moment to the same, as being by long experience better able



to judge of, and, by their secrecy and expedition, to transact some state affairs, than the lords and commons. At present, the privy-council takes cognizance of few or no matters except such as cannot well be determined by the known laws and ordinary courts; such as matters of complaint and sudden emergencies: their constant business being to consult for the public good in affairs of state. This power of the privy-council is to inquire into all offences against the government, and to commit the offenders to safe custody, in order to take their trial in some of the courts of law. But their jurisdiction herein is only to inquire, and not to punish; and the persons committed by them are entitled to their *habeas corpus* by statute 16 Car. I. cap. 10. as much as if committed by an ordinary justice of the peace.

The officers of the privy-council are four clerks of the council in ordinary, three clerks extraordinary, a keeper of the records, and two keepers of the council-chamber. See *PRESIDENT*.

*PRIVY-SEAL*, a seal which the king uses previously to such grants, &c. as are afterwards to pass the great seal. The privy seal is also sometimes used in matters of less consequence, which do not require the great seal.

*PRIZE*. *s.* (*priz*, Fr.) 1. A reward gained by contest with competitors (*Addison*). 2. Reward gained by any performance (*Dryden*). 3. (*prise*, Fr.) Something taken by adventure; plunder (*Pope*).

*PRIZE*, or *PRIZZ*, in maritime affairs, a vessel taken at sea from the enemies of a state, or from pirates; and that either by a man of war, a privateer, &c. having a commission for that purpose. Vessels are looked on as prize, if they fight under any other standard than that of the state from which they have their commission; if they have no charter-party, invoice, or bill of lading aboard; if loaded with effects belonging to the king's enemies, or with contraband goods. In ships of war the prizes are to be divided among the officers, seamen, &c. as his majesty shall appoint by proclamation; but among privateers, the division is according to the agreement between the owners. By stat. 13 Geo. II: c. 4. judges and officers failing of their duty in respect to the condemnation of prizes, forfeit 500*l.* with full costs of suit; one moiety to the king, and the other to the informer.

*To PRIZE*. *v. a.* (*priser*, French.) 1. To rate; to value at a certain price (*Shakspeare*). 2. To esteem; to value highly (*Dryden*).

*PRIZER*. *s.* (*priseur*, Fr.) He that values.

*PRIZEFIGHTER*. *s.* (*prize and fighter*.) One that fights publicly for a reward (*Brams*).

*PRO*. (Latin.) For; in defence of: *pro* and *con*, for *pro* and *contra*, for and against (*Prior*).

*PROA* (Flying), in navigation, is a name given to a vessel used in the South Seas, because with a brisk trade-wind it sails near twenty miles an hour. In the construction of the proa, the head and stern are exactly alike, but the sides are very different; the side intended to be always the lee-side being flat; and the

windward side made rounding, in the manner of other vessels; and to prevent her oversetting, which from her small breadth, and the straight run of her leeward side, would, without this precaution, infallibly happen, there is a frame laid out of her from windward, to the end of which is fastened a log fashioned in the shape of a small boat and made hollow. The weight of the frame is intended to balance the proa, and the small boat is by its buoyancy (as it is always in the water) to prevent her oversetting to windward.

*PROBABILITY* is a word of nearly the same import with likelihood. It denotes the appearance of truth, or that evidence arising from the preponderation of argument which produces opinion. (See *OPINION*.) Locke classes all arguments under the heads demonstrative and probable. Hume, with greater accuracy, divides them into demonstrations, proofs, and probabilities. Demonstration produces science; proof, belief; and probability, opinion.

Hardly any thing is susceptible of strict demonstration besides the mathematical sciences, and a few propositions in metaphysical theology. Physics rest upon principles capable, some of them, of complete proof by experience, and others of nothing more than probability by analogical reasoning. What has uniformly happened, we expect with the fullest confidence to happen again in similar circumstances; what has frequently happened, we likewise expect to happen again; but our expectation is not confident. Uniform experience is proof; frequent experience is probability.

Of probability there are degrees from then neighbourhood of certainty and demonstration, quite down to improbability and unlikeness, even to the confines of impossibility; and also degrees of assent, from certain knowledge, and, what is next to it, full assurance and confidence, quite down to conjecture, doubt, distrust, and disbelief. That proposition then is probable for which there are arguments, or proofs, to make it pass or be received for true. Probability being then to supply the defect of our knowledge, is always conversant about a thing whereof we have no certainty, but only some inducements to receive it for true. The grounds of it are, in short, these two following: First, the conformity of any thing with our own knowledge, experience, or observation. Secondly, the testimony of others vouching their observation and experience. In the testimony of others, is to be considered, 1. the number; 2. the integrity; 3. the skill of the witnesses; 4. the design of the author, if it be a testimony cited out of a book; 5. the consistency of the parts and circumstances of the relation; 6. contrary testimonies. The mind, before it rationally assents or dissents to any probable proposition, ought to examine all the grounds of probability, and see how they make more or less, for or against it; and, upon a due balancing the whole, reject or receive it, with a more or less firm assent, according to the preponderance of the greater grounds of probability, on one side, or the other.

**PROBABILITY OF AN EVENT**, in the doctrine of chances, is the ratio of the number of chances by which the event may happen, to the number by which it may both happen and fail. So that, if there be constituted a fraction, of which the numerator is the number of chances for the events happening, and the denominator the number for both happening and failing, that fraction will properly express the value of the probability of the event's happening. Thus, if an event have 3 chances for happening, and 2 for failing, the sum of which being 5, the fraction  $\frac{3}{5}$  will fitly represent the probability of its happening, and may be taken to be the measure of it. The same thing may be said of the probability of failing, which will likewise be measured by a fraction, whose numerator is the number of chances by which it may fail, and its denominator the whole number of chances both for its happening and failing: so the probability of the failing of the above event, which has 2 chances to fail, and 3 to happen, will be expressed or measured by the fraction  $\frac{2}{5}$ .

Hence, if there be added together the fractions which express the probability for both happening and failing, their sum will always be equal to unity, or 1; since the sum of their numerators will be equal to their common denominator. And since it is a certainty that an event will either happen or fail, it follows that a certainty, which may be considered as an infinitely great degree of probability, is fitly represented by unity. See CHANCES, LIFE, EXPECTATION.

**PROBABLE**. *a.* (*probable*, Fr. *probabilis*, Lat.) Likely; having more evidence than the contrary (*Hooker*).

**PROBABLY**. *ad.* (from *probable*.) Likely; in likelihood (*Swift*).

**PROBANG**. (from *probe*.) A long flexible piece of whalebone, having sponge fixed to the end. The use of it is, to force down into the stomach substances which happen to stick in the oesophagus.

**PROBATE OF WILLS**, is the exhibiting and proving wills and testaments before the ecclesiastical judges, delegated by the bishop, who is ordinary of the place where the party dies.

By the stamp acts, a very heavy duty is now payable upon these instruments, and a man can entitle himself to personal property only by means of a probate; that is, by having proved the will.

**PROBATION**. *s.* (*probatio*, from *probo*, Latin; *probation*, Fr.) 1. Proof; evidence; testimony (*Shakespeare*). 2. The act of proving by ratiocination or testimony (*Locke*). 3. Trial; examination (*Bacon*). 4. Moral trial (*Nelson*). 5. Trial before entrance into monastic life; noviciate (*Pope*).

**PROBATIONARY**. *a.* (from *probation*.) Serving for trial.

**PROBATIONER**. *s.* (from *probation*.) 1. One who is upon trial (*Dryden*). 2. A novice (*Decay of Piety*).

**PROBATIONERSHIP**. *s.* (from *proba-*

*tioner*.) State of being a probationer; noviciate (*Locke*).

**PROBATORY**. *a.* (from *probo*, Latin.) Serving for trial (*Bramhall*).

**PROBATUM EST**. A Latin expression added to the end of a receipt, signifying it is tried or proved (*Prior*).

**PROBE**. (*stylus*, from *probo*, to try; because surgeons try the depth and extent of wounds, &c. with it.) A chirurgical instrument of a long and slender form.

**PROBE-SCISSORS**. *s.* (*probe* and *scissors*.) Scissors used to open wounds, of which the blade thrust into the orifice has a button at the end (*Wiseman*).

**To PROBE**. *v. a.* (*probo*, Lat.) To search; to try by an instrument (*South*).

**PRO'BITY**. *s.* (*probité*, Fr. *probitas*, Lat.) Honesty; sincerity; veracity (*Fiddes*).

**PROBLEM**, (Πρόβλημα) in logic, a doubtful question, or a proposition that neither appears absolutely true nor false; and consequently may be asserted either in the affirmative or negative.

**PROBLEM**, in geometry, is a proposition wherein some operation or construction is required; as to divide a line or angle, erect or let fall perpendiculars, &c. See GEOMETRY.

**PROBLEM**, in algebra, is a question or proposition which requires some unknown truth to be investigated, and the truth of the discovery demonstrated.

**PROBLEM** (Kepler's), in astronomy. See KEPLER'S PROBLEM. See also the treatises on astronomy by Vince, Gregory, &c.

**PROBLEM** (Determinate, Diophantine, Indeterminate, Limited, Linear, Local, Plane, Solid, Sursolid, and Unlimited). See the additions.

**PROBLEM** (Deliacal), in geometry, is the doubling of a cube. This amounts to the same thing as the finding of two mean proportionals between two given lines; whence this also is called the deliacal problem. See DUPLICATION.

**PROBLEMATICAL**. *a.* (from *problem*; *problematique*, Fr.) Uncertain; unsettled; disputed; disputable (*Boyle*).

**PROBLEMATICALLY**. *ad.* Uncertainly.

**PROBOSCIS**, in natural history, is the trunk or snout of an elephant, and some other animals and insects. Flies, gnats, &c. are furnished with a proboscis or trunk, by means of which they suck the blood of animals, the juice of vegetables, &c. for their food.

**PROBUS**, M. Aurelius Severus, a native of Sirmium, in Pannonia. His father was originally a gardener, who, by entering the army, rose to the rank of a military tribune. His son obtained the same office in the 22d year of his age, and he distinguished himself so much by his virtues, that at the death of the emperor Tacitus, he was invested with the imperial purple. He conquered the enemies of Rome in Gaul and Germany. He defeated the Blemmyes in the neighbourhood of Egypt, with great slaughter, and his military character was



## PRO

so well established, that the king of Persia sued for peace by his ambassadors, and attempted to buy the conqueror's favours with the most splendid presents. Probus was then feasting upon the most common food when the ambassadors were introduced, but without even casting his eyes upon them, he said, that if their master did not give proper satisfaction to the Romans, he would lay his territories desolate, and as naked as the crown of his head. As he spoke, the emperor took off his cap, and shewed the baldness of his head to the ambassadors. His conditions were gladly accepted by the Persian monarch. Probus encouraged the liberal arts, and he himself repaired 70 cities in different parts of the empire, which had been reduced to ruins. His army, at length, mutinied, and he was murdered in the 50th year of his age, after a reign of six years and four months, before Christ 282. His very enemies deplored his fate, and even the army, which had been concerned in his fall, erected a monument over his body, and placed upon it this inscription: "Hic Probus imperator, vere probus situs est, victor omnium gentium barbararum, victor etiam tyrannorum."

**PROCA'CIOUS.** *a.* (*procaz*, Lat.) Petulant; loose.

**PROCA'CITY.** *s.* (from *procaxious*.) Petulance; sauciness.

**PROCATA'CTIC.** *a.* (*προκατακτικος*.) Fore-running; remotely antecedent (*Harvey*).

**PROCATA'RXIS.** *s.* (*προκαταρξις*.) The preexistent cause of a disease, which cooperates with others that are subsequent (*Quincy*).

**PROCEDENDO,** in law, a writ whereby a plea or cause, formerly called from an inferior court to the court of chancery, king's bench, or court of common pleas, by writ of privilege, habeas corpus, or certiorari, is released, and returned to the other court to be proceeded in, upon its appearing that the defendant has no cause of privilege, or that the matter in the party's allegation is not well proved.

**PROCEDURE.** *s.* (*procedure*, French.) 1. Manner of proceeding; management; conduct (*South*). 2. Act of proceeding; progress; process; operation (*Hale*). 3. Produce; thing produced (*Bacon*).

To **PROCEED.** *v.n.* (*procedo*, Lat.) 1. To pass from one thing or place to another (*Dryden*). 2. To go forward; to tend to the end designed; to advance (*Ben Jonson*). 3. To come forth from a place or from a sender (*John*). 4. To go or march in state (*Anon.*). 5. To issue; to arise; to be the effect of; to be produced from (*Shakspeare*). 6. To prosecute any design (*Locke*). 7. To be transacted; to be carried on (*Shakspeare*). 8. To make progress; to advance (*Milton*). 9. To carry on juridical process (*Clarendon*). 10. To transact; to act; to carry on any affair methodically (*Milton*). 11. To take effect; to have its course (*Ayliffe*). 12. To be propagated; to come by generation (*Milton*). 13. To be produced by the original efficient cause (*Milton*).

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**PROCEED.** *s.* Produce: as, the proceeds of an estate.

**PROCEEDER.** *s.* (from *proceed*.) One who goes forward; one who makes a progress (*Bacon*).

**PROCEEDING.** *s.* (*procedé*, French.) 1. Progress from one thing to another; series of conduct; transaction (*Swift*). 2. Legal procedure: as, such are the proceedings at law.

**PROCELEUSMATICUS,** in the ancient poetry, a foot consisting of four short syllables, or two pyrrhychiuses; as, *hominibus*.

**PROCELLARIA.** Petrel. In zoology, a genus of the class aves, order anseres. Bill toothless, a little compressed, hooked at the point; mandibles equal; nostrils cylindrical, tubular, truncate, lying in the base of the bill; feet palmate; the back toe pointing downwards, sessile, sharp, a mere spur. Twenty-four species, chiefly natives of America, and Australasia: two found in our own country. These live chiefly at sea, and except at breeding time are seldom seen near land; they have the faculty of spouting from their bills to a considerable distance a large quantity of pure oil; and feed on the fat of dead whales and fishes. The following are chiefly worthy of notice.

1. *P. pelagica*. Stormy procellaria. Black; rump white. Another variety with the head and sides bluish; scrag green; wing-coverts and rump spotted with green. The three outer tail feathers whitish at the base. Inhabits most seas; six inches long; except at breeding time is seldom seen near the shore; braves the utmost fury of storms, sometimes skimming with incredible velocity along the hollows of the waves, sometimes on the summits; if seen hovering round the sterns of vessels is a sure presage to seamen of foul weather.

2. *P. vittata*. Broad-billed petrel. Bluish-ash, beneath white; legs black; bill bluish-grey, very broad at the base. Inhabits the Antarctic seas; lays in holes on rocks; flies by night in numerous flocks; twelve inches long.

3. *P. urinatrix*. Diving petrel. Blackish-brown, beneath white; bill and chin black; legs blue-green, without the spur behind. Inhabits round New Zealand in numerous flocks; eight inches and a half long; dives dextrously.

4. *P. glacialis*. Fulmar petrel. Whitish; back hoary; bill and legs yellowish. Another variety with blackish wings; size of a gull, being seventeen inches long. These birds feed upon the blubber of whales, which is soon converted into an oil, which they inject into the mouths of their young. The natives of New Zealand are greatly indebted to the fulmars for almost every necessary of life. The flesh is a considerable part of their food; the plumage, down for their beds; and the oil, a provision for their lamps, and a medicine in almost every disorder.

5. *P. puffinus*. Shearwater petrel. Above black, beneath white; legs rufous. Another

variety, above cinereous, beneath white; tail clear white. Inhabit the Southern and Antarctic seas; fifteen inches long. They are also found at times in the Hebrides: they lay one egg, white, and blunt at each end; the young are taken in August, sated and barrelled; and when boiled eaten with potatoes. They feed their young with the oil discharged, as already mentioned, from their stomachs; and quit the Scottish isles towards the end of August or the beginning of September, apparently for the Mediterranean.

**PROCELLOUS.** *a.* (*procellosus*, Latin.) Tempestuous.

**PROCEPTION.** *s.* Preoccupation; act of taking something sooner than another: not in use (*King Charles*).

**PROCRITY.** *s.* (from *procerus*, Latin.) Tallness; height of stature (*Addison*).

**PROCESS.** *s.* (*processus*, Lat.) 1. Tendency; progressive course (*Hooker*). 2. Regular and gradual progress (*Knolles*). 3. Course; continual flux or passage (*Hale*). 4. Methodical management of any thing (*Prior*). 5. Course of law (*Suiff*).

**PROCESS.** (from *procedo*, to go before.) In anatomy, an eminence of a bone; as the spinous and transverse processes of the vertebræ.

**PROCESSUS CECIVERMIFORMIS.** In anatomy. See **INTESTINES**.

**PROCESSION.** *s.* (*processio*, Lat.) A train marching in ceremonious solemnity (*Hooker*).

**To PROCESSION.** *v. n.* (from the noun.) To go in procession. A low word.

**PROCESSIONAL.** *a.* (from *procession*.) Relating to procession.

**PROCESSIONARY.** *a.* (from *procession*.) Consisting in procession (*Hooker*).

**PRO'CHRONISM.** *s.* (προχρονισμ.) An error in chronology; a dating a thing before it happened.

**PROCIDO,** an island in the gulf of Naples, near that of Ischia, eight miles in circumference, and very fertile and populous. The capital, of the same name, is a small fortified place, on a high craggy rock, by the seaside. Lon. 14. 8 E. Lat. 40. 43 N.

**PRO'CIDENCE.** *s.* (*procidencia*, Lat.) Falling down; dependance below its natural place.

**PROCIDENTIA.** (from *procido*, to fall down.) In medicine, a falling down of any part of the body; thus, *procidencia ani*, uteri, vagina, &c.

**PRO'CINCT.** *s.* (*procinctus*, Lat.) Complete preparation; preparation brought to the point of action (*Milton*).

**PROCKIA**, in botany, a genus of the class polyandria, order monogynia. Calyx three-leaved, with sometimes two leaflets at the base; corolless; berry five-angled, many-seeded. Four species; one a shrub of Santa Cruz, the rest of the Mauritius.

**To PROCLAIM.** *v. a.* (*proclamo*, Latin.) 1. To promulgate or denounce by a solemn or legal publication (*Deuteronomy*). 2. To tell openly (*Locke*). 3. To outlaw by public denunciation (*Shakspeare*).

**PROCLAIMER.** *s.* (from *proclaim*.) One that publishes by authority (*Milton*).

**PROCLAMATION**, a public notice given of any thing of which the king thinks proper to advertise his subjects.

Proclamations are a branch of the king's prerogative, (see **PREROGATIVE**); and have then a binding force, when (as sir Edward Coke observes) they are grounded upon and enforce the laws of the realm. For, though the making of laws is entirely the work of a distinct part, the legislative branch of the sovereign power, yet the manner, time, and circumstances of putting those laws in execution, must frequently be left to the discretion of the executive magistrate. And therefore his constitutions or edicts, concerning those points which we call proclamations, are binding upon the subject, where they do not either contradict the old laws, or tend to establish new ones; but only enforce the execution of such laws as are already in being, in such manner as the king shall judge necessary.

**PROCLIVITY.** *s.* (*proclivitas*, Latin.) 1. Tendency; natural inclination; propension; proneness (*Bramhall*). 2. Readiness; facility of attaining (*Wotton*).

**PROCLIVOUS.** *a.* (*proclivis*, Latin.) Inclined; tending by nature.

**PROCLUS**, surnamed Diadocus, a Greek philosopher and mathematician, was born in Lycia, and lived about the year 500. He was the disciple of Syrianus, and had a great share in the friendship of the emperor Anastasius. It is said, that when Vitalian laid siege to Constantinople, Proclus burnt his ships with large brazen speculums. This philosopher was a pagan, and wrote against the Christian religion. There are still extant his Commentaries on some of Plato's books, and a tedious commentary on the first two books of Euclid's Elements. The latter work has been translated into English by Mr Thomas Taylor.

**PROCONSUL**, a Roman magistrate, sent to govern a province with consular authority. The proconsuls were appointed out of the body of the senate; and usually as the year of any one's consulate expired, he was sent proconsul into some province. The proconsuls decided cases of equity and justice, either privately in their pretorium or palace, where they received petitions, heard complaints, granted writs under their seal, and the like; or else publicly, in the common hall, with the usual formalities observed in the court of judicature at Rome. They had besides, by virtue of their edicts, the power of ordering all things relating to the tribunes, taxes, contributions, and provisions of corn and money, &c. Their office lasted only a year. See **CONSUL**.

**PROCONSULSHIP**, the office of a proconsul.

**PROCOPIUS**, a celebrated officer of a noble family in Cilicia. He was related to the emperor Julian, and lived with him in great intimacy. After he had signalized himself under Julian and his successor, he retired from



the Roman provinces among the barbarians in the Thracian Chersonesus, and proclaimed himself master of the eastern empire. His usurpation was universally acknowledged, but fortune changed, and Procopius was defeated in Phrygia, and abandoned by his army. His head was cut off, and carried to Valentinian, in Gaul, A. D. 366. Procopius was slain in the 42d year of his age.

**PROCOPIUS** of Cæsarea, an historian in great reputation under Justinian, and secretary to Belisarius in all his wars.—His history contains eight books, two of the Persian war, as many of the wars of the Vandals, and four of the Goths. It was published at Paris in 1662, in 2 vols. folio.

**TO PROCRASTINATE.** *v. a.* (*procrastinor*, Lat.) To defer; to delay; to put off from day to day (*Shakspeare*).

**TO PROCRASTINATE.** *v. n.* To be dilatory (*Swift*).

**PROCRASTINATION.** *s.* (*procrastinatio*, Latin.) Delay; dilatoriness (*Decay of Piety*).

**PROCRASTINATOR.** *s.* (from *procrastinate*.) A dilatory person.

**PROCREANT.** *a.* (*procreans*, Lat.) Productive; pregnant (*Shakspeare*).

**TO PROCREATE.** *v. a.* (*procreo*, Latin.) To generate; to produce (*Bentley*).

**PROCREATION.** *s.* (*procreatio*, Latin.) Generation; production (*Raleigh*).

**PROCREATIVE.** *a.* (from *procreate*.) Generative; productive (*Hale*).

**PROCREATIVENESS.** *s.* (from *procreate*.) Power of generation (*Decay of Piety*).

**PROCREATOR.** *s.* (from *procreate*.) Generator; begetter.

**PROCRUSTES**, a famous robber of Attica, called also Polypemon, who was killed by Theseus, near the Cephissus. He tied travellers on a bed, and, if their length exceeded that of the bed, he used to cut part off, but if they were shorter, he had them stretched to make their length equal to it.

**PROCTALGIA.** (*πρωκταλγια*, from *πρωτος*, the fundament, and *αλγος*, pain.) A violent pain at the anus. It is mostly symptomatic of some disease, as piles, scirrhus, prurigo, cancer, &c.

**PROCTITIS.** (*πρωκτιτις*, from *πρωτος*, the anus.) Inflammation of the internal or mucous membrane of the lower part of the rectum.

**PROCTOR**, a person commissioned to manage another person's cause in any court of the civil or ecclesiastical law. The proctors of the clergy are the representatives chosen by the clergy to sit in the lower house of convocation; of these there are two for each diocese, and one for each collegiate church.

**PROCTORS**, in the university, are two officers chosen from among the residents to see good orders and exercises daily performed there.

**TO PROCTOR.** *v. a.* (from the noun.) To manage. A cant word (*Shakspeare*).

**PROCTORSHIP.** *s.* (from *proctor*.) Office or dignity of a proctor (*Clarendon*).

**PROCULEIUS**, a Roman knight, celebrated for his fraternal kindness to his brothers Muræna and Scipio, after they had forfeited their estates, and incurred the displeasure of Augustus for siding with young Pompey. He was sent by Augustus to Cleopatra, to endeavour to bring her alive into his presence, but to no purpose. He destroyed himself when labouring under a heavy disease.

**PROCUMBENT.** *a.* (*procumbens*, Lat.) Lying down; prone.

**PROCUMBENT STEM.** Horizontaliter supraterram. Philos. Bot. Debilis terræ innitens. Delin. Pl.—Unable to support itself, and therefore lying upon the ground—but without putting forth roots. (See *REPENT*.) The procumbent, trailing, or prostrate stem, as it is sometimes called, is exemplified in convolvulus soldanella.

**PROCURABLE.** *a.* (from *procure*.) To be procured; obtainable; acquirable (*Boyle*).

**PROCURACY.** *s.* (from *procure*.) The management of any thing.

**PROCURATION.** *s.* (from *procure*.) The act of procuring (*Woodward*).

**PROCURATOR**, a person who has a charge committed to him to act for another. Thus the proxies of the lords in parliament are, in our law-books, called procurators; the bishops are sometimes called procuratores ecclesiarum; and the representatives sent by the clergy to convocation, procuratores clerici. The word is also used for a vicar or lieutenant; and we read of a procurator regni, who was an ancient magistrate. Those who manage causes in Doctors' Commons are also called procurators or proctors. In our statutes, he who gathers the fruits of a benefice for another is particularly called a procurator, and the instrument empowering him to receive them is termed a procuracy.

**PROCURATORIAL.** *a.* (from *procurator*.) Made by a proctor (*Ayliffe*).

**PROCURATORY.** *a.* (from *procurator*.) Tending to procuration.

**TO PROCURE.** *v. a.* (*procuro*, Lat.) 1. To manage; to transact for another. 2. To obtain; to acquire (*Milton*). 3. To persuade; to prevail on (*Herbert*). 4. To contrive; to forward (*Shakspeare*).

**TO PROCURE.** *v. n.* To bawd; to pimp (*Dryden*).

**PROCUREMENT.** *s.* The act of procuring (*Dryden*).

**PROCURER.** *s.* (from *procure*.) 1. One that gains; obtainer (*Walton*). 2. Pimp; pander (*South*).

**PROCURESS.** *s.* (from *procure*.) A bawd (*Spectator*).

**PROCYON**, in astronomy, a fixed star of the second magnitude in the constellation called canis minor. See *CANIS*.

**PRODANO**, an island in the Mediterranean, near the W. coast of the Morea, formerly called Sphacteria. It is 36 miles S.S.E. of Zante. Lon. 21. 24 E. Lat. 37. 15 N.

**PRODICUS**, a sophist and rhetorician of the isle of Cos, flourished about 396 B. C.

He taught at Athens, and had for disciples Euripides, Socrates, Theramenes, and Isocrates. The Athenians put him to death on pretence that he corrupted the morals of their youth.

**PRODIGAL**. *a.* (*prodigus*, Lat.) Profuse; wasteful; expensive; lavish (*Philips*).

**PRODIGAL**. *s.* A waster; a spendthrift (*Dryden*).

**PRODIGALITY**. *s.* (*prodigalité*, French.) Extravagance; profusion; waste; excessive liberality (*Glanville*).

**PRODIGALLY**. *ad.* (from *prodigal*.) Profusely; wastefully; extravagantly (*Dryden*).

**PRODIGIOUS**. *a.* (*prodigiosus*, Latin.) Amazing; astonishing; such as may seem a prodigy; enormous; monstrous (*Bacon*).

**PRODIGIOUSLY**. *ad.* Amazingly; astonishingly; portentously; enormously (*Ray*).

**PRODIGIOUSNESS**. *s.* (from *prodigious*.) Enormousness; portentousness; amazing qualities.

**PRODIGY**. *s.* (*prodigium*, Lat.) 1. Any thing out of the ordinary process of nature, from which omens are drawn; portent (*Addison*). 2. Monster (*Ben Jonson*). 3. Any thing astonishing for good or bad (*Spectator*).

**PRODITION**. *s.* (*proditio*, Lat.) Treason; treachery (*Ainsworth*).

**PRODITOR**. *s.* (Latin.) A traitor: not in use (*Shakspeare*).

**PRODITORIOUS**. *a.* (from *proditor*, Lat.) 1. Traitorous; treacherous; perfidious: not in use (*Daniel*). 2. Apt to make discoveries (*Wotton*).

**To PRODUCE**. *v. a.* (*produco*, Lat.) 1. To offer to the view or notice (*Isaiah*). 2. To exhibit to the public (*Swift*). 3. To bring as an evidence (*Shakspeare*). 4. To bear; to bring forth, as a vegetable (*Sandys*). 5. To cause; to effect; to generate; to beget (*Bacon*).

**PRODUCE**. *s.* (from the noun.) 1. Product; that which any thing yields or brings (*Dryden*). 2. Amount; profit; gain; emergent sum or quantity (*Addison*).

**PRODUCENT**. *s.* (from *produce*.) One that exhibits; one that offers (*Ayliffe*).

**PRODUCER**. *s.* (from *produce*.) One that generates or produces (*Suckling*).

**PRODUCIBLE**. *a.* (from *produce*.) 1. Such as may be exhibited (*South*). 2. Such as may be generated or made (*Boyle*).

**PRODUCIBLENESS**. *s.* (from *producibile*.) The state of being producible (*Boyle*).

**PRODUCT**. *s.* (*productus*, Lat.) 1. Something produced by nature, as fruits, grain, metals (*Spectator*). 2. Work; composition (*Watts*). 3. Thing consequential; effect (*Milton*).

**PRODUCT**, in arithmetic, or algebra, is the factum of two numbers, or quantities, or the quantity arising from, or produced by, the multiplication of two or more numbers, &c. together. Thus, 48 is the product of 6 multiplied by 8.—In multiplication, unity is in proportion to one factor, as the other factor is to the product. So 1:6::8:48.

In algebra, the product of simple quantities

is expressed by joining the letters together like a word, and prefixing the product of the numerical coefficients: so the product of *a* and *b* is *ab*, of *3a* and *4bc* is *12 abc*. But the product of compound factors or quantities is expressed by setting the sign of multiplication between them, and binding each compound factor in a vinculum: so the product of *2a + 3b* and *a - 4c* is  $2a + 3b \times a - 4c$ , or  $(2a + 3b) \times (a - 4c)$ .

In geometry, a rectangle answers to a product, its length and breadth being the two factors; because the numbers expressing the length and breadth being multiplied together produce the content or area of the rectangle.

**PRODUCTILE**. *a.* (from *produco*, Lat.) Which may be produced, or drawn out at length.

**PRODUCTION**. *s.* (from *product*.) 1. The act of producing (*Dryden*). 2. The thing produced; fruit; product (*Swift*). 3. Composition; work of art or study (*Swift*).

**PRODUCTIVE**. *a.* (from *produce*.) Having the power to produce; fertile; generative; efficient (*Milton*).

**PROEDRI**, among the Athenians, were magistrates, who had the first seats at the public assemblies, and whose office it was to propose at each assembly the things to be deliberated upon and determined. Their office always ended with the meeting. Their number was nine so long as the tribes were ten in number.

**PRO'EM**. *s.* (*προοίμιον*) Preface; introduction (*Swift*).

**PROFANATION**. *s.* (from *profano*, Lat.) 1. The act of violating any thing sacred (*Shakspeare*). 2. Irreverence to holy things or persons (*Shakspeare*).

**PROFANE**. *a.* (*profane*, Fr. from *profanus*, Lat.) 1. Irreverent to sacred names or things (*South*). 2. Not sacred; secular (*Burnet*). 3. Polluted; not pure (*Raleigh*). 4. Not purified by holy rites (*Dryden*).

**To PROFANE**. *v. a.* (*profano*, Latin; *profaner*, Fr.) 1. To violate; to pollute (*Milton*). 2. To put to wrong use (*Shakspeare*).

**PROFANELY**. *ad.* (from *profane*.) With irreverence to sacred names or things (*Esdraus*).

**PROFANENESS**. *s.* (from *profane*.) Irreverence of what is sacred (*Dryden*).

**PROFANER**. *s.* (from *profane*.) Polluter; violater (*Hooker*).

**PROFECTION**. *s.* (*profectio*, Lat.) Advancement; progression (*Brown*).

**To PROFESS**. *v. a.* (*professer*, Fr. from *professus*, Lat.) 1. To declare himself in strong terms of any opinion or character (*Milton*). 2. To make a show of any sentiments by loud declaration (*Shakspeare*). 3. To declare publicly one's skill in any art or science, so as to invite employment (*Shakspeare*).

**To PROFESS**. *v. m.* 1. To declare openly (*Titus*). 2. To enter into a state of life by a public declaration (*Dayton*). 3. To declare friendship: not in use (*Shakspeare*).

**PROFESSEDLY**. *ad.* (from *professed*.) According to open declaration made by himself (*Dryden*).



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**PROFESSION.** *s.* (from *profess.*) 1. Calling; vocation; known employment (*Sprat*). 2. Declaration (*Swift*). 3. The act of declaring one's self of any party or opinion (*Tillotson*).

**PROFESSIONAL.** *a.* (from *profession.*) Relating to a particular calling or profession (*Clarissa*).

**PROFESSOR.** *s.* (*professeur*, Fr.) 1. One who declares himself of any opinion or party (*Bacon*). 2. One who publicly practises or teaches an art (*Swift*). 3. One who is visibly religious (*Locke*).

**PROFESSORSHIP.** *s.* (from *professor.*) The station or office of a public teacher (*Walton*).

**TO PROFFER.** *v. a.* (*profero*, Lat.) 1. To propose; to offer to acceptance (*Spenser*). 2. To attempt of one's own accord (*Milton*).

**PROFFER.** *s.* (from the verb.) 1. Offer made; something proposed to acceptance (*Clarendon*). 2. Essay; attempt (*Bacon*).

**PROFFERER.** *s.* (from *proffer.*) He that offers (*Collier*).

**PROFICIENCE. PROFICIENCY.** *s.* (from *proficio*, Latin.) Profit; advancement in any thing; improvement gained (*Rogers*).

**PROFICIENT.** *s.* (*proficiens*, Lat.) One who has made advances in any study or business (*Boyle*).

**PROFICUOUS.** *a.* (*proficiuus*, Lat.) Advantageous; useful (*Philips*).

**PROFILE** in architecture, the draught of a building, fortification, &c. wherein are expressed the several heights, widths, and thicknesses, such as they would appear, were the building cut down perpendicularly from the roof to the foundation.

**PROFILE** also denotes the outline of a figure, building, member of architecture, &c. Hence profiling sometimes denotes designing or describing the member with the rule, compass, &c.

**PROFILE** in sculpture and painting, denotes a head, portrait, &c. when represented side ways, or in a side view. On almost all medals, faces are represented in profile.

**PROFIT.** *s.* (*profit*, Fr.) 1. Gain; pecuniary advantage (*Swift*). 2. Advantage; accession of good (*Bacon*). 3. Improvement; advancement; proficiency.

**TO PROFIT.** *v. a.* (*profiter*, Fr.) 1. To benefit; to advantage (*Job*). 2. To improve; to advance (*Dryden*).

**TO PROFIT.** *v. n.* 1. To gain advantage (*Arbuthnot*). 2. To make improvement (*Dryden*). 3. To be of use or advantage (*Prior*).

**PROFITABLE.** *a.* (*profitable*, Fr. from *profit*.) 1. Gainful; lucrative (*Bacon*). 2. Useful; advantageous (*Arbuthnot*).

**PROFITABLENESS.** *s.* (from *profitable*.) 1. Gainfulness. 2. Usefulness; advantageousness (*More*).

**PROFITABLY.** *ad.* (from *profitable*.) 1. Gainfully. 2. Advantageously; usefully (*Wake*).

**PROFITLESS.** *a.* (from *profit*.) Void of gain or advantage (*Shakspeare*).

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**PROFLIGATE.** *a.* (*profligatus*, Latin.) Abandoned; lost to virtue and decency; shameless (*Roscommon*).

**PROFLIGATE.** *s.* An abandoned shameless wretch (*Swift*).

**TO PROFLIGATE.** *v. a.* (*profligo*, Latin.) To drive away; not used (*Harvey*).

**PROFLIGATELY.** *ad.* (from *profligate*.) Shamelessly (*Swift*).

**PROFLIGATENESS.** *s.* (from *profligate*.) The quality of being profligate.

**PROFLUENCE.** *s.* (from *profluent*.) Progress; course (*Watton*).

**PROFLUVIA.** (from *profluo*, to run down.) Fluxes. The fifth order in the class pyrexiae of Cullen's nosology, characterized by pyrexia, with increased excretions.

**PROFLUVII CORTEX.** See **CONESSI CORTEX**.

**PROFLUENT.** *a.* (from *profluens*, Lat.) Flowing forward (*Milton*).

**PROFOUND.** *a.* (*profundus*, Latin.) 1. Deep; descending far below the surface; low with respect to the neighbouring places (*Milton*). 2. Intellectually deep; not obvious to the mind: as, *a profound treatise*. 3. Lowly; humble; submissive; submissive (*Duppa*). 4. Learned beyond the common reach (*Hooker*). 5. Deep in contrivance (*Hosea*). 6. Having hidden qualities (*Shakspeare*).

**PROFOUND.** *s.* 1. The deep; the main; the sea (*Sandys*). 2. The abyss (*Milton*).

**TO PROFOUND.** *v. n.* (from the noun.) To dive; to penetrate (*Glanville*).

**PROFOUNDLY.** *ad.* (from *profound*.) 1. Deeply; with deep concern (*Shakspeare*). 2. With great degrees of knowledge; with deep insight (*Dryden*).

**PROFOUNDNESS.** *s.* (from *profound*.) 1. Depth of place. 2. Depth of knowledge.

**PROFUNDITY.** *s.* (from *profound*.) Depth of place or knowledge (*Milton*).

**PROFUNDUS.** See **FLEXOR PROFUNDUS PERFORANS**.

**PROFUSE.** *a.* (*profusus*, Lat.) 1. Lavish; too liberal; prodigal (*Addison*). 2. Overabounding; exuberant (*Milton*).

**PROFUSELY.** *ad.* (from *profuse*.) 1. Lavishly; prodigally (*Harte*). 2. With exuberance (*Thomson*).

**PROFUSENESS.** *s.* (from *profuse*.) Lavishness; prodigality (*Aiterbury*).

**PROFUSIO.** A loss of blood. A genus of disease in the class locales and order apocynoses of Cullen.

**PROFUSION.** *s.* (*profusio*, Lat.) 1. Lavishness; prodigality; extravagance (*Rowe*). 2. Lavish expense; superfluous effusion (*Hay*). 3. Abundance; exuberant plenty (*Addison*).

**TO PROG.** *v. n.* A low word. 1. To rob; to steal. 2. To shift meanly for provisions (*L'Estrange*).

**PROG.** *s.* (from the verb.) Victuals; provision of any kind (*Congreve*).

**PROGENERATION.** *s.* (*progenero*, Lat.) The act of begetting; propagation.

**PROGENITOR.** *s.* (*progenitus*, Lat.) A

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forefather; an ancestor in a direct line (*Addison*).

**PROGENY.** *s.* (*progenio*, old Fr. *progenies*, Latin.) Offspring; race; generation (*Addison*).

**PROGNOSIS.** (*προγνωσις*, from *πρo*, before, and *γινωσκω*, to know.) The judgment of the event of a disease by particular symptoms.

**PROGNOSTIC.** *a.* (*prognostique*, French; *προγνωστικός*.) Foretelling disease or recovery; foreshowing.

**PROGNOSTIC.** *s.* (from the adjective.) 1. The skill of foretelling diseases, or the event of diseases (*Arbuthnot*). 2. A prediction (*Swift*). 3. A token forerunning (*South*).

**PROGNOSTICABLE.** *a.* (from *prognosticate*.) Such as may be foreknown or foretold (*Brown*).

**To PROGNOSTICATE.** *v. a.* (from *prognostic*.) To foretel; to foreshow (*Clarendon*).

**PROGNOSTICATION.** *s.* (from *prognosticate*.) 1. The act of foreknowing or foreshowing (*Burnet*). 2. Foretoken (*Sidney*).

**PROGNOSTICATOR.** *s.* (from *prognosticate*.) Foreteller; foreknower (*Government of the Tongue*).

**PROGRAMMA**, anciently signified a letter sealed with the king's seal.

**PROGRAMMA** is also a university term for a billet or advertisement, posted up or given into the hand, by way of invitation to an oration, &c. containing the argument, or so much as is necessary for understanding it.

**PROGRESS.** *s.* (*progrés*, Fr. from *progressus*, Latin.) 1. Course; procession; passage (*Shakspeare*). 2. Advancement; motion forward (*Bacon*). 3. Intellectual improvement; advancement in knowledge; proficiency (*Locke*). 4. Removal from one place to another (*Denham*). 5. A journey of state; a circuit (*Bacon*).

**To PROGRESS.** *v. n.* (*progredior*, Lat.) To move forward; to pass: not used (*Shakspeare*).

**PROGRESSION.** *s.* (*progressio*, Latin.) 1. Proportional process; regular and gradual advance (*Newton*). 2. Motion forward (*Brown*). 3. Course; passage (*Shakspeare*). 4. Intellectual advance (*Locke*).

**PROGRESSION**, in arithmetic and algebra, an orderly advancing or proceeding in the same manner, course, tenor, proportion, &c.

Progression is either arithmetical, or geometrical.

*Arithmetical progression*, is a series of quantities proceeding by continued equal differences, either increasing or decreasing. Thus,

increasing 1, 3, 5, 7, 9, &c. or  
decreasing 21, 18, 15, 12, 9, &c.

where the former progression increases continually by the common difference 2, and the latter series or progression decreases continually by the common difference 3.

*Geometrical progression*, is a series of quantities proceeding in the same continual ratio or proportion, either increasing or decreasing; or it is a series of quantities that are con-

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tinually proportional; or which increase by one common multiplier, or decrease by one common divisor; which common multiplier or divisor is called the common ratio. As,

increasing, 1, 2, 4, 8, 16, &c.

decreasing, 81, 27, 9, 3, 1, &c.;

where the former progression increases continually by the common multiplier 2, and the latter decreases by the common divisor 3.

Or ascending,  $a$ ,  $ra$ ,  $r^2a$ ,  $r^3a$ , &c.

or descending,  $a$ ,  $\frac{a}{r}$ ,  $\frac{a}{r^2}$ ,  $\frac{a}{r^3}$ , &c.;

where the first term is  $a$ , and common ratio  $r$ . See ARITHMETICAL and GEOMETRICAL.

**PROGRESSIONAL.** *a.* (from *progression*.) Such as are in a state of increase or advance (*Brown*).

**PROGRESSIVE.** *a.* (*progressif*, French.) Going forward; advancing (*Brown*).

**PROGRESSIVE**, in music, an epithet properly applied to lessons expressly composed for the purpose of practical improvement, and which are so constructed in point of increasing execution, as to lead the practitioner by insensible degrees to those difficulties which he could not well encounter without such preparatory exercises. In music, as in the other arts and sciences, the path to improvement has been greatly smoothed, and the labour of the tutor much abridged; by those simple introductory precepts, and practical examples, which some of the first professors have deigned to furnish: and excellence has in consequence been more generally attained than in former ages, when the early advances of the juvenile pupil were less consulted by the learned and ingenious.

**PROGRESSIVE NOTES**, those which succeed each other, either in ascent or descent, by those degrees the settled order of which constitutes the key of the composition, or of the movement, or the passage, in which they take place.

**PROGRESSIVELY.** *ad.* (from *progressive*.) By gradual steps or regular course (*Holder*).

**PROGRESSIVENESS.** *s.* (from *progressive*.) The state of advancing.

**To PROHIBIT.** *v. a.* (*prohibeo*, Latin.) 1. To forbid; to interdict by authority (*Sidney*). 2. To debar; to hinder (*Milton*).

**PROHIBITER.** *s.* (from *prohibit*.) Forbiddier; interdicter.

**PROHIBITION.** *s.* (*prohibition*, French; *prohibitio*, Lat.) Forbiddance; interdict; act of forbidding (*Tillotson*).

**PROHIBITORY.** *a.* (from *prohibit*.) Implying prohibition; forbidding (*Ayliffe*).

**To PROJE/CT.** *v. a.* (*projectus*, Latin.) 1. To throw out; to cast forward (*Pope*). 2. To exhibit a form, as of the image thrown on a mirror (*Dryden*). 3. (*projetter*, Fr.) To scheme; to form in the mind; to contrive.

**To PROJE/CT.** *v. n.* To jut out; to shoot forward; to shoot beyond something next it.



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**PROJECT.** *s.* (*projet*, Fr. from the verb.) Scheme; design; contrivance (*Rogers*).

**PROJECTILE.** *a.* (*projectile*, Fr.) Impelled forward (*Arbuthnot*).

**PROJECTILE.** *s.* (from the adj.) A body put in motion (*Cheyne*).

**PROJECTILES** is the name for that part of mechanical philosophy which treats of the motion of bodies any how projected from the surface of this earth, and influenced by the action of terrestrial gravity.

It is demonstrated in the physical part of astronomy that a body so projected must describe a conic section, having the centre of the earth in one focus; and that it will describe round that focus areas proportional to the times. And it follows from the principles of that science, that if the velocity of projection exceeds 36700 feet in a second, the body (if not resisted by the air) would describe a hyperbola; if it be just 36700, it would describe a parabola; and if it be less than this, it would describe an ellipsis. If projected directly upwards, in the first case, it would never return, but proceed for ever; its velocity continually diminishing, but never becoming less than an assignable portion of the excess of the initial velocity above 36700 feet in a second; in the second case, it would never return, its velocity would diminish without end, but never be extinguished. In the third case, it would proceed till its velocity was reduced to an assignable portion of the difference between 36700 and its initial velocity; and would then return, regaining its velocity by the same degrees, and in the same places, as it lost it. These are necessary consequences of a gravity directed to the centre of the earth, and inversely proportional to the square of the distance. But in the greatest projections that we are able to make, the gravitations are so nearly equal, and in directions so nearly parallel, that it would be ridiculous affectation to pay any regard to the deviations from equality and parallelism. A bullet rising a mile above the surface of the earth, loses only one two-thousandth of its weight, and a horizontal range of four miles makes only  $\frac{1}{4}$  of deviation from parallelism.

The action of gravitation is therefore assumed as equal and parallel, through the whole course of the motion of a projectile; and from this assumption, Galileo, the father of dynamical science, demonstrated that the path of a projectile, as a bullet thrown from a gun, is a parabola; leaving the resistance of the air out of the consideration.

Yet the effects of this resistance are by far too great to be neglected by a careful investigator. For Mr. Robins has shown that, in some cases, this resistance to a cannon ball amounts to more than 20 times the weight of the ball; and Dr. Hutton, having prosecuted this subject far beyond any former example, sometimes found this resistance amount to near 100 times the weight of the ball, viz. when it moved with a velocity of 2000 feet per second, which is a rate of almost 23 miles in a minute. What errors then may not be expected from an hypothesis which neglects this force, as inconsiderable! Indeed it is easy to show, that the path of such projectiles is neither a parabola nor nearly a parabola. For, by that theory, if the ball, in the instance last mentioned, flew in the curve of a parabola, its horizontal range, at  $45^\circ$  elevation,

would be found to be almost 24 miles; whereas it often happens that the ball, with such a velocity, ranges far short of even one mile.

Indeed the falseness of this hypothesis almost appears at sight, even in projectiles slow enough to have their motion traced by the eye; for they are seen to descend through a curve manifestly shorter and more inclined to the horizon than that in which they ascended, and the highest point of their flight, or the vertex of the curve, is much nearer to the place where they fall on the ground, than to that from whence they were at first discharged. These things cannot for a moment be doubted of by any one, who in a proper situation views the flight of stones, arrows, or shells, thrown to any considerable distance.

Mr. Robins has not only detected the errors of the parabolic theory of gunnery, which takes no account of the resistance of the air, but shows how to compute the real range of resisted bodies. But for the method which he proposes, and the tables he has computed for this purpose, see his *Tracts of Gunnery*, p. 183, &c. vol. I. and Euler's *Commentary* on the same, translated by Mr. Hugh Brown, in 1777.

We have already treated this subject pretty copiously under the word *Gunnery*; but we therein spoke of some expected investigations of Dr. Hutton, on this interesting topic, part of which, as they have appeared in the third volume of the doctor's valuable *Course of Mathematics*, may very advantageously to our scientific readers be introduced here.

In conclusion, from the experiments of 1775, the following important deductions were fairly drawn and stated, viz.

- 1st, It is made evident by these experiments, that gunpowder fires almost instantaneously.
- 2dly, The velocities communicated to shot of the same weight, with different charges of powder, are nearly as the square roots of those charges.
- 3dly, And when shot of different weights are fired with the same charge of powder, the velocities communicated to them are nearly in the inverse ratio of the square roots of their weights.
- 4thly, So that, in general, shot which are of different weights, and impelled by the firing of different charges of powder, acquire velocities which are directly as the square roots of the charges of powder, and inversely as the square roots of the weights of the shot.
- 5thly, It would therefore be a great improvement in artillery, occasionally to make use of shot of a long shape, or of heavier matter, as lead; for thus the momentum of a shot, when discharged with the same charge of powder, would be increased in the ratio of the square root of the weight of the shot; which would both augment proportionally the force of the blow with which it would strike, and the extent of the range to which it would go.
- 6thly, It would also be an improvement, to diminish the windage; since by this means, one third or more of the quantity of powder might be saved.
- 7thly, When the improvements mentioned in the last two articles are considered as both taking place, it appears that about half the quantity of powder might be saved. But, important as this saving may be, it appears to be still exceeded by that of the guns: for thus a small gun may be made to have the effect and execution of another of two or three times its size in the present way, by discharging a long shot of 2 or 3 times the weight of its usual ball, or round shot; and thus

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a small ship might employ shot as heavy as those of the largest now used.

Finally, as these experiments prove the regulations with respect to the weight of powder and shot, when discharged from the same piece of ordnance; so, by making similar experiments with a gun varied in its length, by cutting off from it a certain part, before each set of trials, the effects and general rules for the different lengths of guns may be with certainty determined by them. In short, the principles on which these experiments were made are so fruitful in consequences, that, in conjunction with the effects of the resistance of the medium, they appear to be sufficient for answering all the inquiries of the speculative philosopher, as well as those of the practical artillerist.

Such then was the summary conclusion from the first set of experiments with cannon balls, in the year 1775, and such were the probable advantages to be derived from them. We are not aware however that any alterations were adopted from them by authority in the public service: unless we are to except the instance of carronades, a species of ordnance that was afterwards invented, and in some degree adopted in the public service; for, in this instance, the proprietors of those pieces, by availing themselves of the circumstances of large balls, and very small windage, have, with small charges of powder, and at little expense, been enabled to produce very considerable and useful effects with those light pieces.

The 2d set of these experiments extended through most part of the summer seasons of the years 1783, 1784, 1785, and some in 1786. The objects of this course were numerous and various: but the principal articles as follow: 1. The velocities with which balls are projected by equal charges of powder, from pieces of equal weight and calibre, but of different lengths. 2. The velocities with different charges of powder, the weight and length of the guns being equal. 3. The greatest velocities due to the different lengths of guns, to be ascertained by successively increasing the charge, till the bore should be filled, or till the velocity should decrease again. 4. The effect of varying the weight of the piece; every thing else being the same. 5. The penetrations of balls into blocks of wood. 6. The ranges and times of flight of balls; to compare them with their first velocities, for ascertaining the resistance of the medium. 7. The effect of wads; of different degrees of ramming, or compressing the charge; of different degrees of windage; of different positions of the vent; of chambers and trunnions, and every other circumstance necessary to be known for the improvement of artillery.

An ample account is given of these experiments, and the results deduced from them in the doctor's volume of Tracts published in 1786; some few circumstances only of which can be noted here. In this course, 4 brass guns were employed, very nicely bored and cast on purpose, of different lengths, but equal in all other respects, viz. in weight and bore, &c. The lengths of the bores of the guns were,

the gun N<sup>o</sup> 1, was 15 calibres, length of bore 28.5 in.  
 ..... N<sup>o</sup> 2, .. 20 calibres, ..... 38.4  
 ..... N<sup>o</sup> 3, .. 30 calibres, ..... 57.7  
 ..... N<sup>o</sup> 4, .. 40 calibres, ..... 80.2  
 the calibre of each being 2 $\frac{1}{8}$  inches, and the medium weight of the balls 16 oz. 13 dr.

The mediums of all the experimented velocities of the balls, with which they struck the pendulous block of wood, placed at the distance of 32 feet from the muzzle of the gun, for several charges of powder, were as in the following table,

| Table of initial velocities. |                   |                   |                   |                   |
|------------------------------|-------------------|-------------------|-------------------|-------------------|
| Powder.                      | The guns.         |                   |                   |                   |
| oz.                          | N <sup>o</sup> 1. | N <sup>o</sup> 2. | N <sup>o</sup> 3. | N <sup>o</sup> 4. |
| 2                            | 780               | 835               | 920               | 970               |
| 4                            | 1100              | 1180              | 1300              | 1370              |
| 6                            | 1340              | 1445              | 1590              | 1680              |
| 8                            | 1430              | 1580              | 1790              | 1940              |
| 12                           | 1436              | 1640              | .                 | .                 |
| 14                           | .                 | 1660              | .                 | .                 |
| 16                           | .                 | .                 | 2000              | .                 |
| 18                           | .                 | .                 | .                 | 2200              |

placed in the 1st column, for all the four guns, the numbers denoting so many feet per second. Whence in general it appears how the velocities increase with the charges of powder, for each gun, and also how they increase as the guns are longer, with the same charge, in every instance.

By increasing the quantity of the charges continually, for each gun, it was found that the velocities continued to increase till they arrived at a certain degree, different in each gun; after which, they constantly decreased again, till the bore was quite filled with the charge. The charges of powder when the velocities arrived at their maximum or greatest state were various, as might be expected, according to the lengths of the guns; and the weight of powder, with the length it extended in the bore, and the fractional part of the bore it occupied, are shown in the following table, of the charges for the greatest effect.

| Gun,<br>N <sup>o</sup> . | Length<br>of the<br>bore. | The charge.    |         |                   |
|--------------------------|---------------------------|----------------|---------|-------------------|
|                          |                           | Weight,<br>oz. | Length. |                   |
|                          |                           |                | Inches. | Part of<br>whole. |
| 1                        | 28.5                      | 12             | 8.2     | $\frac{1}{3}$     |
| 2                        | 38.4                      | 14             | 9.5     | $\frac{3}{12}$    |
| 3                        | 57.7                      | 16             | 10.7    | $\frac{1}{6}$     |
| 4                        | 80.2                      | 18             | 12.1    | $\frac{2}{20}$    |

Some few experiments in this course were made to obtain the ranges and times of flight, the mediums of which are exhibited in the following table.



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| Guns.             | Powder. | Balls.  |       | Elevat. gun. | Time of flight. | Range. | First veloc. |
|-------------------|---------|---------|-------|--------------|-----------------|--------|--------------|
|                   |         | Weight. | Diam. |              |                 |        |              |
| N <sup>o</sup> 2. | oz.     | oz. dr. | inch. |              | secs.           | feet.  | feet.        |
|                   | 2       | 16 10   | 1.96  | 45°          | 21.2            | 5109   | 863          |
| ditto.            | 4       | 16 5    | 1.96  | 15           | 9.2             | 4130   | 868          |
| ditto.            | 4       | 16 8    | 1.96  | 15           | 9.2             | 4660   | 1234         |
| ditto.            | 8       | 16 12   | 1.96  | 15           | 14.4            | 6066   | 1644         |
| ditto.            | 12      | 16 12   | 1.95  | 15           | 15.5            | 6700   | 1676         |
| N <sup>o</sup> 3. | 8       | 15 8    | 1.96  | 15           | 10.1            | 5610   | 1938         |

In this table are contained the following concomitant data, determined with a tolerable degree of precision; viz. the weight of the powder, the weight and diameter of the ball, the initial or projectile velocity, the angle of elevation of the gun, the time in seconds of the ball's flight through the air, and its range, or the distance where it fell on the horizontal plane. From which it is hoped that some aid may be derived towards ascertaining the resistance of the medium, and its effects on other elevations, &c. and so afford some means of obtaining easy rules for the cases of practical gunnery; though the completion of this enquiry, for want of time at present, must be referred to another work.

Another subject of enquiry in the foregoing experiments, was, how far the balls would penetrate into solid blocks of elm wood, fired in the direction of the fibres. The following tablet shows the results of a few of the trials that were made with the gun N<sup>o</sup> 2, with the most frequent charges of 2, 4, and 8 ounces of powder; and the mediums of the penetrations, as placed in the last line, are found to be 7, 15, and 20 inches, with those charges. These penetrations are nearly as the numbers

2, 4, 6, or 1, 2, 3; but the charges of powder are as

2, 4, 8, or 1, 2, 4; so that the penetrations are proportional to the charges as far as to 4 ounces, but in a less ratio at 3 ounces; whereas, by the theory of penetrations, the depths ought to be proportional to the charges, or, which is the same thing, as the squares of the velocities. So that it seems the resisting force of the wood is not uniformly or constantly the same, but that it increases a little with the increased velocity of the ball. This may probably be occasioned by the greater quantity of fibres driven before the ball; which may thus increase the spring and resistance of the wood, and prevent the ball from penetrating so deep as it otherwise might do.

| Penetrations of balls into solid elm wood. |      |       |
|--------------------------------------------|------|-------|
| Powder 2                                   | 4    | 8 oz. |
| 7                                          | 16.6 | 18.9  |
|                                            | 13.5 | 21.2  |
|                                            |      | 18.1  |
|                                            |      | 20.8  |
|                                            |      | 20.5  |
| Means 7                                    | 15   | 20    |

From a general inspection of this second course of these experiments, it appears that all the de-

ductions and observations made on the former course are here corroborated and strengthened, respecting the velocities and weights of the balls, and charges of powder, &c. It further appears also that the velocity of the ball increases with the increase of charge only to a certain point, which is peculiar to each gun, where it is greatest; and that by further increasing the charge, the velocity gradually diminishes, till the bore is quite full of powder. That this charge for the greatest velocity is greater as the gun is longer, but yet not greater in so high a proportion as the length of the gun is; so that the part of the bore filled with powder, bears a less proportion to the whole bore in the long guns, than it does in the shorter ones; the part which is filled being indeed nearly in the inverse ratio of the square root of the empty part.

It appears that the velocity, with equal charges, always increases as the gun is longer; though the increase in velocity is but very small in comparison to the increase in length; the velocities being in a ratio somewhat less than that of the square roots of the length of the bore, but greater than that of the cube roots of the same, and is indeed nearly in the middle ratio between the two.

It appears, from the table of ranges, that the range increases in a much lower ratio than the velocity, the gun and elevation being the same. And when this is compared with the proportion of the velocity and length of gun in the last paragraph, it is evident that we gain extremely little in the range by a great increase in the length of the gun, with the same charge of powder. In fact, the range is nearly as the 5th root of the length of the bore; which is so small an increase, as to amount only to about a 7th part more range for a double length of gun. From the same table it also appears, that the time of the ball's flight is nearly as the range; the gun and elevation being the same.

It has been found, by these experiments, that no difference is caused in the velocity, or range, by varying the weight of the gun, nor by the use of wads, nor by different degrees of ramming, nor by firing the charge of powder in different parts of it. But that a very great difference in the velocity arises from a small degree in the windage: indeed with the usual established windage only, viz. about  $\frac{1}{10}$  of the calibre, no less than between  $\frac{1}{2}$  and  $\frac{1}{4}$  of the powder escapes and is lost: and as the balls are often smaller than the regulated size, it frequently happens that half the powder is lost by unnecessary windage.

It appears too that the resisting force of wood, to balls fired into it, is not constant: and that the depths penetrated by balls, with different velocities or charges, are nearly as the logarithms of the charges, instead of being as the charges them-

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velocities, or, which is the same thing, as the square of the velocity. Lastly, these and most other experiments show, that balls are greatly deflected from the direction in which they are projected: and that as much as 300 or 400 yards in a range of a mile, or almost  $\frac{1}{4}$  of the range.

We have before adverted to a 3d set of experiments, of still more importance, with respect to

the resistance of the medium, than any of the former; but, till the publication of those experiments, we cannot avail ourselves of all the discoveries they contain. In the mean time, however, we may extract from them the three following tables of resistances, for three different sizes of balls, and for velocities between 100 feet and 2000 feet per second of time.

| TABLE I.                                                                  |              |                |                 |         | TABLE II.                                                   |                   |                  | TABLE III.                                                              |                   |                  |
|---------------------------------------------------------------------------|--------------|----------------|-----------------|---------|-------------------------------------------------------------|-------------------|------------------|-------------------------------------------------------------------------|-------------------|------------------|
| Resistances to a ball of 1.965 inches diameter, and 16 oz. 13 dr. weight. |              |                |                 |         | Resistances to a ball 2.78 inc. diameter, and 3 lb. weight. |                   |                  | Resistances to a ball 3.55 inc. diameter, and 6 lb. 1 oz. 8 dr. weight. |                   |                  |
| Vel.                                                                      | Resistances. |                | 1 Dif.          | 2d Dif. | Vel.                                                        | Res.              | Difs.            | Vel.                                                                    | Res.              | Difs.            |
| feet.                                                                     | lbs.         | ozs.           |                 |         | feet.                                                       | lbs.              |                  | feet.                                                                   | lbs.              |                  |
| 100                                                                       | 0.17         | $2\frac{3}{4}$ | 8 $\frac{1}{4}$ |         | 900                                                         | 35                | 6                | 1200                                                                    | 115               |                  |
| 200                                                                       | 0.69         | 11             | 5 $\frac{3}{4}$ |         | 950                                                         | 41                | 6                | 1250                                                                    | 124               | 9                |
| 300                                                                       | 1.56         | 25             | 6               |         | 1000                                                        | 47                | 6                | 1300                                                                    | 133               | 9                |
| 400                                                                       | 2.81         | 45             | 7               |         | 1050                                                        | 53                | 6                | 1350                                                                    | 142               | 9                |
| 500                                                                       | 4.30         | 72             | 8               |         | 1100                                                        | 60                | 7                | 1400                                                                    | 152               | 10               |
| 600                                                                       | 6.69         | 107            | 9               |         | 1150                                                        | 67                | 7                | 1450                                                                    | 162               | 10               |
| 700                                                                       | 9.44         | 151            | 10              |         | 1200                                                        | 74                | 7                | 1500                                                                    | 172 $\frac{1}{2}$ | 10 $\frac{1}{2}$ |
| 800                                                                       | 12.81        | 205            | 12              |         | 1250                                                        | 82                | 8                | 1550                                                                    | 184               | 11 $\frac{1}{2}$ |
| 900                                                                       | 16.94        | 271            | 13              |         | 1300                                                        | 91                | 9                | 1600                                                                    | 197               | 13               |
| 1000                                                                      | 21.88        | 350            | 13              |         | 1350                                                        | 101               | 10               | 1650                                                                    | 211               | 14               |
| 1100                                                                      | 27.63        | 442            | 12              |         | 1400                                                        | 112               | 11               | 1700                                                                    | 226               | 15               |
| 1200                                                                      | 34.13        | 546            | 11              |         | 1450                                                        | 122 $\frac{1}{2}$ | 10 $\frac{1}{2}$ | 1750                                                                    | 242               | 16               |
| 1300                                                                      | 41.31        | 661            | 9               |         | 1500                                                        | 132 $\frac{1}{2}$ | 10               | 1800                                                                    | 259               | 17               |
| 1400                                                                      | 49.06        | 785            | 7               |         | 1550                                                        | 141 $\frac{1}{2}$ | 9                |                                                                         |                   |                  |
| 1500                                                                      | 57.25        | 916            | 4               |         | 1600                                                        | 150               | 8 $\frac{1}{2}$  |                                                                         |                   |                  |
| 1600                                                                      | 65.69        | 1051           | 0               |         | 1650                                                        | 158               | 8                |                                                                         |                   |                  |
| 1700                                                                      | 74.13        | 1186           | -2              |         | 1700                                                        | 165               | 7                |                                                                         |                   |                  |
| 1800                                                                      | 82.44        | 1331           | -5              |         | 1750                                                        | 171               | 6                |                                                                         |                   |                  |
| 1900                                                                      | 90.44        | 1447           | -6              |         | 1800                                                        | 176               | 5                |                                                                         |                   |                  |
| 2000                                                                      | 98.06        | 1569           |                 |         |                                                             |                   |                  |                                                                         |                   |                  |

PROB. I.—To determine the resistance of the medium against a ball of any other size, moving with any of the velocities given in the foregoing tables.

The analogy among the numbers in all these tables is very remarkable and uniform, the same general laws running through them all. The same laws are also observable as in the table of resistances near the end of the 2d volume, particularly the 1st and 2d remarks immediately following that table, viz. that the resistances increase in a higher proportion than the square of the velocities with the same body; and that the resistances also increase in a rather higher ratio than the surfaces, with different bodies, but the same velocity. Yet this latter case, viz. the ratios of the resistances and of the surfaces, or of the squares of the diameters, which is the same thing, are so nearly alike, that they may be considered as equal to each other in any calculations relating to artillery practice. For example, suppose it were required to determine what would be the resistance of the air against a 24 lb. ball discharged with a velocity of 2000 feet per second of time. Now, by the 1st of the foregoing tables, the ball of 1.965 inches diameter, when moving with the velocity 2000, suffered a resistance of 98 lb.: then, since the resistances, with the same velocity, are as the surfaces; and the surfaces are as the squares of the diameters; and the diameters being

1.965 and 5.6, the squares of which are 3.86 and 31.36, therefore as 3.86:31.36::98 lb.:796 lb.; that is, the 24 lb. ball would suffer the enormous resistance of 796 lb. in its flight, in opposition to the direction of its motion!

And, in general, if the diameter\* of any proposed ball be denoted by  $d$ , and  $r$  denote the resistance in the 1st table due to the proposed

velocity of the 1.965 ball; then  $\frac{d^2 r}{3.86}$  will denote

the resistance with the same velocity against the ball whose diameter is  $d$ ; or it is nearly  $\frac{1}{8} d^2 r$ , which is but the 28th part greater than the former.

PROB. II.—To assign a rule for determining the resistance due to any indeterminate velocity of a given ball.

This problem is very difficult to perform near the truth, on account of the variable ratio which the resistance bears to the velocity, increasing always more and more above that of the square of the velocity, at least to a certain extent; and indeed it appears that there is no single integral power whatever of the velocity, or no expression of the velocity in one term only, that can be proportional to the resistances throughout. It is true indeed, that such an expression can be assigned by means of a fractional power of the velocity, or rather one whose index is a mixed number, viz.



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$\frac{1}{10}$  or  $2 \cdot 1$ ; thus,  $\frac{v^2}{5400} =$  the resistance, is a formula in one term only, which will answer to all the numbers in the first table of resistances very nearly, and consequently, by means of the ratio of the squares of the diameters of the balls, for any other balls whatever. This formula then, though serving quite well for some particular resistance, or even for constructing a complete series or table of resistances, is not proper for the use of problems in which fluxions and fluents are concerned, on account of the mixed number  $2 \frac{1}{10}$ , in the index of the velocity  $v$ .

We must therefore have recourse to an expression in two terms, or a formula containing two integral powers of the velocity, as  $v^2$  and  $v$ , the 1st and 2d powers, affected with general coefficients  $m$  and  $n$ , as  $mv^2 + nv = r$ , the resistance. Now, to determine the general numerical values of the coefficients  $m$  and  $n$ , we must adapt this general expression  $mv^2 + nv = r$ , to two particular cases of velocity, at a convenient distance from each other, in one of the foregoing tables of resistances, as the first for instance. Now, after making several trials in this way, Dr. Hutton found that the two velocities of 500 and 1000 answer the general purpose better than any other that has been tried. Thus then, employing these two cases, we must first make  $v = 500$ , and  $r = 4 \frac{1}{2}$  lb, its correspondent resistance, and then again  $v = 1000$ , and  $r = 21 \cdot 88$  lb. the resistance belonging to it: this will give two equations, by which the general value of  $m$  and of  $n$  will be determined. Thus then the two equations being

$$500^2 m + 500 n = 4 \cdot 5,$$

$$\text{and } 1000^2 m + 1000 n = 21 \cdot 88;$$

dividing the 1st by 500, and  $\frac{1}{2}$   $500 m + n = \cdot 009$ , the 2d by 1000, they are  $\frac{1}{2}$   $1000 m + n = \cdot 02188$ ; the dif of these is  $\dots\dots\dots 500 m = \cdot 01288$ , and therefore div. by 500, gives  $m = \cdot 00002576$ ; hence  $n = \cdot 009 - 500 m = \cdot 009 - \cdot 01288 = - \cdot 00388 = n$ . Hence then the general formula will be  $\cdot 00002576 v^2 - \cdot 00388 v = r$ , the resistance nearly in avoirdupois pounds, in all cases or all velocities whatever.

Now, to find how near to the truth this theorem comes, in every instance in the table, by substituting for  $v$ , in this formula, all the several velocities, 100, 200, 300, &c. to 2000; these give the correspondent values of  $r$ , or the resistances, as in the 2d column of the following table, their velocities being in the first column; and the real experimented resistances are set opposite to them in the 3d or last column of the same. By the comparison of the numbers in these two columns together, it is seen that there are no where any great difference between them, being sometimes a little in excess, and again a little in defect, by very small differences; so that, on the whole, they will nearly balance one another, in any particular instance of the range or flight of a ball, in all degrees of its velocity, from the first or greatest, to the smallest or last. Except in the first two or three numbers, at the beginning of the table, for the velocities 100, 200, 300, for which cases another theorem may be employed. Now, in these three velocities, as well as in all that are smaller, down to nothing, the theorem  $\cdot 00001725 v^2 = r$  the resistance, will very well serve, as it brings out for the first three resistances  $\cdot 17$ , and  $\cdot 69$ , and  $1 \cdot 554$ , differing in the last only by a very small fraction.

| Velocs.<br>or $v$ . | Comput.<br>resists. | Exper.<br>resists. |
|---------------------|---------------------|--------------------|
| 100                 | $\cdot 13$          | $\cdot 17$         |
| 200                 | $\cdot 25$          | $\cdot 69$         |
| 300                 | $1 \cdot 15$        | $1 \cdot 56$       |
| 400                 | $2 \cdot 57$        | $2 \cdot 81$       |
| 500                 | $4 \cdot 50$        | $4 \cdot 50$       |
| 600                 | $6 \cdot 94$        | $6 \cdot 69$       |
| 700                 | $9 \cdot 90$        | $9 \cdot 44$       |
| 800                 | $13 \cdot 38$       | $12 \cdot 81$      |
| 900                 | $17 \cdot 37$       | $16 \cdot 94$      |
| 1000                | $21 \cdot 88$       | $21 \cdot 88$      |
| 1100                | $26 \cdot 90$       | $27 \cdot 63$      |
| 1200                | $32 \cdot 44$       | $34 \cdot 13$      |
| 1300                | $38 \cdot 49$       | $41 \cdot 31$      |
| 1400                | $45 \cdot 06$       | $49 \cdot 06$      |
| 1500                | $52 \cdot 14$       | $57 \cdot 25$      |
| 1600                | $59 \cdot 74$       | $65 \cdot 69$      |
| 1700                | $67 \cdot 85$       | $74 \cdot 13$      |
| 1800                | $76 \cdot 48$       | $82 \cdot 44$      |
| 1900                | $85 \cdot 62$       | $90 \cdot 44$      |
| 2000                | $95 \cdot 28$       | $98 \cdot 06$      |

**Corol. 1.** The foregoing rule  $\cdot 00002576 v^2 - \cdot 00388 v = r$ , denotes the resistance for the ball in the first table, whose diameter is  $1 \cdot 965$ , the square of which is  $3 \cdot 86$ , or almost 4; hence to adapt it to a ball of any other diameter  $d$ , we have only to alter the former in proportion to the squares of the diameters, by which it becomes

$$\frac{dd}{3 \cdot 86} (\cdot 00002576 v^2 - \cdot 00388 v) = (\cdot 00000667 v^2 - \cdot 0010) d^2 = (\cdot 00000000 v^2 - \cdot 0010) d^2,$$

which is the resistance for the ball whose diameter is  $d$ , with the velocity  $v$ .

**Corol. 2.** And, in a similar manner, to adapt the theorem  $\cdot 00001725 v^2 = r$ , for the smaller velocities, to any other size of ball, we must multiply it by  $\frac{dd}{3 \cdot 86}$ , the ratio of the surfaces, by which it becomes  $\cdot 00000447 d^2 v^2 = r$ .

We shall soon take occasion to make some applications in the use of the foregoing formulas, after considering the effects of such velocities in the cases of nonresistances.

**PROB. III.**—To determine the height to which a ball will rise, when fired from a cannon perpendicularly upwards, with a given velocity, in a non-resisting medium, or supposing no resistance in the air.

Any body projected upwards, with a given velocity, will ascend to the height due to the velocity, or the height from which it must naturally fall to acquire that velocity; and the spaces fallen being as the square of the velocities; also 16 feet being the space due to the velocity 32; therefore the space due to any proposed velocity  $v$ , will be found thus, as  $32^2 : 16 :: v^2 : s$  the space, or as  $64 : 1 :: v^2 : \frac{1}{4} v^2 = s$  the space, or the height to which the velocity  $v$  will cause the body to rise, independent of the air's resistance.

**Exam.** For example, if the first or projectile velocity be 2000 feet per second, being nearly the greatest experimented velocity, then the rule  $\frac{1}{4} v^2 = s$  becomes  $\frac{1}{4} \times 2000^2 = 62500$  feet =  $11 \frac{1}{2}$  miles; that is, any body, projected with the velocity 2000

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feet, would ascend nearly 12 miles in height, without resistance.

*Corol.* Because, by art. 88, Projectiles, vol. 2, the greatest range is just double the height due to the projectile velocity, therefore the range, at an elevation of  $45^\circ$ , with the velocity in the last example, would be  $23\frac{1}{2}$  miles, in a nonresisting medium. We shall now see what the effects will be with the resistance of the air.

**PROB. IV.**—To determine the height to which a ball projected upwards, as in the last problem, will ascend, being resisted by the atmosphere.

Putting  $x$  to denote any variable and increasing height ascended by the ball;  $v$  its variable and decreasing velocity there;  $d$  the diameter of the ball, its weight being  $w$ ;  $m = .000003$ , and  $n = .001$ , the coefficients of the two terms denoting the law of the air's resistance. Then  $(mv^2 - nv)d^2$ , by cor. 1. to prob. 2, will be the resistance of the air against the ball in avoirdupois pounds; to which if the weight of the ball be added, then  $(mv - nv)d^2 + w$  will be the whole resistance to the ball's motion; this divided by  $w$ , the weight of the ball in motion, gives  $\frac{(mv^2 - nv)d^2 + w}{w} = \frac{mv^2 - nv}{w} d^2$

+  $\frac{1}{w} = f$  the retarding force. Hence the general formula  $v\dot{v} = 2gf\dot{x}$  (theor. 10. p. 342, vol. 2, edit. 6, Course) becomes  $-v\dot{v} = 2g\dot{x} \times \frac{(mv^2 - nv)d^2 + w}{w}$ , making  $\dot{v}$  negative because  $v$  is decreasing, where  $g = 16$  feet; and hence

$$\dot{x} = -\frac{w}{2g} \times \frac{v\dot{v}}{(mv^2 - nv)d^2 + w} = \frac{-v\dot{v}}{2gmd^2} \times \frac{v\dot{v}}{v^2 - \frac{n}{m}v + \frac{w}{md^2}}$$

Now, for the easier finding the fluent of this, assume  $v - \frac{n}{2m} = z$ ; then  $v = z + \frac{n}{2m}$ , and  $v^2 = z^2 + \frac{n}{m}z + \frac{n^2}{4m^2}$ , and  $v\dot{v} = z\dot{z} + \frac{n}{2m}\dot{z}$ , and  $v^2 - \frac{n}{m}v + \frac{w}{md^2} = z^2 - \frac{n^2}{4m^2} + \frac{w}{md^2}$ ; these being substituted in the above value of  $\dot{x}$ , it becomes

$$\dot{x} = \frac{-w}{2gmd^2} \times \frac{z\dot{z} + \frac{n}{2m}\dot{z}}{z^2 - \frac{n^2}{4m^2} + \frac{w}{md^2}} = \frac{-w}{2gmd^2} \times \frac{z\dot{z} + p\dot{z}}{z^2 + \frac{w}{md^2} - p^2}$$

$= \frac{-w}{2gmd^2} \times \frac{z\dot{z} + p\dot{z}}{z^2 + q^2}$ , putting  $p = \frac{n}{2m}$ , and  $q^2 = \frac{w}{md^2} - p^2$ , or  $p^2 + q^2 = \frac{w}{md^2}$ .

Then the general fluents, taken by the 8th and 11th forms, vol. 2. p. 307, give  $x = \frac{-w}{2gmd^2} \times [\frac{1}{2} \log.$

$$(z^2 + q^2) + \frac{p}{q^2} \times \text{arc to rad. } q \text{ and tan. } z] = \frac{-w}{2gmd^2} \times [\frac{1}{2} \log. (v^2 - \frac{n}{m}v + \frac{w}{md^2}) + \frac{p}{q^2} \times \text{arc to rad. } q$$

and tang.  $v - p$ ]. But, at the beginning of the motion, when the first velocity is  $v$  for instance, and the space  $x = 0$ , this fluent becomes

$$0 = \frac{-w}{2gmd^2} \times [\frac{1}{2} \log. (v^2 - \frac{n}{m}v + \frac{w}{md^2}) + \frac{p}{q^2} \times \text{arc to rad. } q \tan. v - p].$$

Hence by subtraction, and taking  $v = 0$  for the end of the motion, the correct fluent becomes

$$x = \frac{-w}{2gmd^2} \times [\frac{1}{2} \log. (v^2 - \frac{n}{m}v + \frac{w}{md^2}) - \frac{1}{2} \log. \frac{w}{md^2} + \frac{p}{q^2} \times (\text{arc tan. } v - p - \text{arc tan. } -p \text{ to rad. } q)].$$

But as part of this fluent, denoted by  $\frac{p}{q^2} \times$  the dif. of the two arcs to tans.  $v - p$  and  $-p$ , is always very small in comparison with the other preceding terms, they may be omitted without material error in any practical instance; and then the fluent is  $x = \frac{w}{4gmd^2} \times \text{hyp. log.}$

$$v^2 - \frac{n}{m}v + \frac{w}{md^2} \frac{w}{md^2}, \text{ for the utmost height to which}$$

the ball will ascend, when its motion ceases, and is stopped, partly by its own gravity, but chiefly by the resistance of the air.

But now, for the numerical value of the general coefficient  $\frac{w}{4gmd^2}$ , and the term  $\frac{w}{md^2}$ ; because the mass of the ball to the diameter  $d$ , is  $.5236d^3$ , if its specific gravity be  $s$ , its weight will be  $.5236sd^3 = w$ ; therefore  $\frac{w}{d^3} = .5236sd$ , and  $\frac{w}{md^2} =$

$$78540sd, \text{ this divided by } 4g \text{ or } 64, \text{ it gives } \frac{w}{4gmd^2} =$$

$1227.2sd$  for the value of the general coefficient, to any diameter  $d$  and specific gravity  $s$ . And if we further suppose the ball to be cast iron, the specific gravity, or weight of one cubic inch of which is  $.26855$ , it becomes  $330d$ , for that coefficient; also  $78540sd = 21090d = \frac{w}{md^2}$ , and  $\frac{n}{m} = 150$ .

And hence the foregoing fluent becomes  $330d \times \text{hyp. log. } \frac{v^2 - 150v + 21090d}{21090d}$  or  $760d \times \text{com. log.}$

$\frac{v^2 - 150v + 21090d}{21090d}$ , changing the hyperbolic for the common logs. And this is a general expression for the altitude in feet, ascended by any iron ball, whose diameter is  $d$  inches, discharged with any velocity  $v$  feet. So that, substituting any values of  $d$  and  $v$ , the particular heights will be given to which the balls will ascend, which it is evident will be nearly in proportion to the diameter  $d$ .

*Exam. 1.* Suppose the ball be that belonging to the first table of resistances, its weight being 16oz. 13dr. or 1.05lb. and its diameter 1.965 inc. when discharged with the velocity 2000 feet, being nearly the greatest charge for any iron ball. The calculation being made with these values of  $d$  and  $v$ , the height ascended is found to be 2920 feet, or little more than half a mile; though found to be almost 12 miles without the air's resistance. And thus the height may be found for any other diameter and velocity.

*Exam. 2.* Again, for the 24lb. ball, with the same



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velocity 2000, its diameter being  $5.6 = d$ . Here  $760d = 4256$ , and  $\frac{v^2 - 150v + 21090d}{21090d} = \frac{38181}{1181}$ , the log. of which is  $1.50958$ ; theref.  $1.50958 \times 4256 = 6424 = x$  the height, being a little more than a mile.

We may now examine what will be the height ascended, considering the resistance always as the square of the velocity.

**PROB. V.**—To determine the height ascended by a ball projected as in the two foregoing problems; supposing the resistance of the air to be as the square of the velocity.

Here it will be proper to commence with selecting some experimented resistance corresponding to a medium kind of velocity, between the first or greatest velocity and nothing, from which to compute the other general resistances, by considering them as the squares of the velocities. It is proper to assume a near medium velocity and its resistance, because, if we assume or commence with the greatest, or the velocity of projection, and compute from it downwards, the resistances will be everywhere too great, and the altitude ascended much less than just; and, on the other hand, if we assume or commence with a small resistance, and compute from it all the others upwards, they will be much too little, and the computed altitude far too great. But, commencing with a medium degree, as for instance that which has a resistance about the half of the first or greatest resistance, or rather a little more, and computing from that, then all those computed resistances above that will be rather too little, but all those below it too great; by which it will happen, that the defect of the one side will be compensated by the excess on the other, and the final conclusion must be near the truth.

Thus then, if we wish to determine, in this way, the altitude ascended by the ball employed in the 1st table of resistances, when projected with 2000 feet velocity; we perceive by the table, that to the velocity 2000 corresponds the resistance 98 lb. the half of this is 49, to which resistance corresponds the velocity 1400 in the table, and the next greater velocity 1500, with its resistance  $57\frac{1}{4}$ , which will be properest to be employed here. Hence then, for any other velocity  $v$ , in general, it will be, according to the law of the squares of

the velocities, as  $1500^2 : v^2 :: 57\frac{1}{4} : \frac{57\frac{1}{4}v^2}{1500^2} =$

$.000025\frac{1}{4}v^2 = av^2$ , putting  $a = .000025\frac{1}{4}$ , which will denote the air's resistance for any velocity  $v$ , very nearly, counting from 3000.

Now, let  $x$  denote the altitude ascended when the velocity is  $v$ , and  $w$  the weight of the ball: then, as above,  $av^2$  is the resistance from the air, hence  $av^2 + w$  is the whole resisting force, and

$\frac{av^2 + w}{w} = f$  the retarding force;

therefore  $-vv = 2gf\dot{x} = \frac{av^2 + w}{w} \times 2g\dot{x}$ ;

and hence  $\dot{x} = \frac{-w}{2g} \times \frac{vv}{av^2 + w} = \frac{-w}{2ga} \times \frac{vv}{v^2 + \frac{w}{a}}$ ;

the fluent of which, by form 8, is  $\frac{-w}{4ga} \times \text{hyp. log.}$

$(v^2 + \frac{w}{a})$ ; which when  $x=0$ , and  $v=v$  the first or projectile velocity, becomes  $0 = \frac{-w}{4ga} \times \text{hyp. log.}$

$(v^2 + \frac{w}{a})$ ; therefore by subtracting, the correct fluent is  $x = \frac{w}{4ga} \times \text{hyp. log.} \frac{av^2 + w}{av^2 + w}$ , the height  $x$

when the velocity is reduced to  $v$ ; and when  $v=0$ , or the velocity is quite exhausted, this becomes

$\frac{w}{4ga} \times \text{hyp. log.} \frac{av^2 + w}{w}$  for the whole height to which the ball will ascend.

**Ex. 1.** The values of the letters being  $w = 105$  lb.  $4g = 64$ ,  $a = .000025\frac{1}{4}$ , the last expression becomes

$645 \times \text{hyp. log.} \frac{v^2 + 41266}{41266}$ , or  $1484 \times \text{com. log.}$

$\frac{v^2 + 41266}{41266}$ . And here the first velocity  $v$  being

2000, the same expression  $1484 \times \text{log.} \frac{v^2 + 41266}{41266}$

becomes  $1484 \times \text{log. of } 97.93 = 2955$  for the height ascended, on this hypothesis; which was 2920 by the former problem, being nearly the same.

**Ex. 2.** Supposing the same ball to be projected with the velocity of only 1500 feet. Then taking 1100 velocity, whose tabular resistance is 27.6, being next above the half of that for 1500. Hence, as  $1100^2 : v^2 :: 27.6 : .00002375v^2 = av^2$ . This va-

lue of  $a$  substituted in the theorem  $\frac{w}{4ga} \times \text{hyp. log.}$

$\frac{av^2 + w}{w}$ , also 1500 for  $v$ , and 105 for  $w$ , it brings

out  $x = 2728$  for the height in this case, being but a little above the ratio of the square roots of the velocities 2000 and 1500, as that ratio would give only 2560.

**Ex. 3.** To find the height ascended by the first ball, projected with 860 feet velocity. Here taking 600, whose resistance 6.69 is a near medium;

then as  $600^2 : 6.69 :: 1 : .0000186 = a$ . Hence  $\frac{w}{64a}$

$\times \text{hyp. log.} \frac{av^2 + w}{w} = 2334$  the height; which is

less than half the range (5100) at  $45^\circ$  elevation, but more than half the range (4100) at  $15^\circ$  elevation, in p. 161, vol. 2; being indeed nearly a medium between the two.

**Ex. 4.** With the same ball, and 1640 velocity. Assume 1200, whose resistance 34.13 is nearly a medium. Then as  $1200^2 : 34.13 :: 1 : .0000237$

$= a$ . Hence  $\frac{w}{64a} \times \text{h. l.} \frac{av^2 + w}{w} = 2854$ ; again,

less than half the range (6000) by experiment in vol. 2, even with  $15^\circ$  elevation.

**Ex. 5.** For any other ball, whose diameter is  $d$ , and its weight  $w$ , the resistance of the air being

$ad^2v^2 = \frac{d^2v^2}{150000} = bd^2v^2$ , putting  $b = \frac{1}{150000}$ , there-

tarding force will be  $\frac{bd^2v^2 + w}{w}$ , thence  $-vv = 2g\dot{x} \times$

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$\frac{bd^2v^2+w}{w}$ , and  $\dot{x} = \frac{-w}{2g} \times \frac{v}{bd^2v^2+w}$ , and the cor. flu.

$$x = \frac{w}{4gbd^2} \times \text{hyp. log. } \frac{bd^2v^2+w}{bd^2v^2} = \frac{w}{4gbd^2} \times \text{hyp. log.}$$

$\frac{bd^2v^2+w}{w}$  for the whole height when  $v=0$ . Now,

if the ball be a 24 pounder, whose diameter is 5.6,

and its square 31.36; then  $bd^2 = \frac{62.72}{300000} = .0002091$ ,

$$\text{and } \frac{w}{4gbd^2} = \frac{24}{46bd^2} = \frac{3}{8bd^2} = 1794; \text{ and } bd^2v^2 =$$

$$836, \text{ and } \frac{bd^2v^2+w}{w} = \frac{836+24}{24} = \frac{860}{24} = \frac{215}{6}, \text{ there-}$$

$$\text{fore } x = 1794 \times \text{hyp. log. } \frac{215}{6} = 1794 \times 3.57888 =$$

6420, being more than double the height of that of the small ball, or a little more than a mile, and very nearly the same as in the 2d example to prob. 4.

PROB. VI.—To determine the time of the ball's ascending to the height determined in the last problem, by the same projectile velocity as there given.

$$\text{By that prob. } \dot{x} = \frac{-w}{2ga} \times \frac{v}{v^2 + \frac{w}{a}}, \text{ ther. } t = \frac{\dot{x}}{v} =$$

$$\frac{-w}{2ga} \times \frac{v}{v^2 + \frac{w}{a}}; \text{ the fluent of which, by form 11,}$$

$$\text{is } \frac{-w}{2ga} \sqrt{\frac{a}{w}} \times \text{arc to radius } 1 \text{ tang. } \frac{v}{\sqrt{\frac{w}{a}}} = \frac{-1}{2g} \sqrt{\frac{a}{w}}$$

$$\frac{w}{a} \times \text{arc tan. } \frac{v}{\sqrt{\frac{w}{a}}}; \text{ or by correction } t = \frac{1}{2g} \sqrt{\frac{w}{a}}$$

$$\times (\text{arc tang. } \frac{v}{\sqrt{\frac{w}{a}}} - \text{arc tang. } \frac{v}{\sqrt{\frac{w}{a}}}), \text{ the time in}$$

general when the first velocity  $v$  is reduced to  $v$ . And when  $v=0$ , or the velocity ceases, this be-

$$\text{comes } t = \frac{1}{2g} \sqrt{\frac{w}{a}} \times \text{arc to tang. } \frac{v}{\sqrt{\frac{w}{a}}} \text{ for the}$$

time of the whole ascent.

Now, as in the last prob.  $v=2000$ ,  $w=1.05$ ,

$$a = .000025 \frac{229}{9000000}. \text{ Hence } \frac{w}{a} = 41266, \text{ and}$$

$$\sqrt{\frac{w}{a}} = 203.14, \text{ and } \frac{v}{\sqrt{\frac{w}{a}}} = 98.445 \text{ the tangent,}$$

to which corresponds the arc of  $89^\circ 25'$ , whose

$$\text{length is } 1.5606; \text{ then } \frac{1}{2g} \times 203.14 \times 1.5606 =$$

$$\frac{203.14 \times 1.5606}{32} = 9.91, \text{ the whole time of ascent.}$$

Remark. The time of freely ascending to the same height 2955 feet, that is, without the air's resistance, would be  $\sqrt{\frac{2955}{16}} = 13.59$ ; and the time of freely ascending, commencing

with the same velocity 2000, would be  $\frac{v}{2g} =$

$$\frac{2000}{32} = 62 \frac{1}{2} = 1' 2 \frac{1}{2}.$$

PROB. VII.—To determine the same as in problem V. taking into the account the decrease of density in the air as the ball ascends in the atmosphere.

In the preceding problems, relating to the height and time of balls ascending in the atmosphere, the decrease of density in the upper parts of it has been neglected, the whole height ascended by the ball being supposed in air of the same density as at the earth's surface. But it is well known that the atmosphere must and does decrease in density upwards, in a very rapid degree; so much so indeed, as to decrease in geometrical progression, at altitudes which rise only in arithmetical progression; by which it happens, that the altitudes ascended are proportional only to the logarithms of the decrease of density there. Hence it results, that the balls must be always less and less resisted in their ascent, with the same velocity, and that they must consequently rise to greater heights before they stop. It is now therefore to be considered what may be the difference resulting from this circumstance.

Now, the nature and measure of this decreasing density of ascents in the atmosphere, has been explained and determined in prop. 76, p. 244, &c. vol. 2. It is there shown, that if  $D$  denote the air's density at the earth's surface, and  $d$  its density at any altitude  $a$ , or  $x$ ; then is  $x = 63551 \times$

log. of  $\frac{D}{d}$  in feet, when the temperature of the air is  $55^\circ$ ; and  $60000 \times \log. \frac{D}{d}$  for the temperature of freezing cold; we may therefore assume for the medium  $x = 62000 \times \log. \frac{D}{d}$  for a mean degree between the two.

But to get an expression for the density  $d$ , in terms of  $x$ , out of logarithms, without which it could not be introduced into the measure of the ball's resistance, in a manageable form, we find in the first place, by a neat approximate expression

for the natural number to the log. of a ratio,  $\frac{D}{d}$ ,

whose terms do not greatly differ, invented by Dr. Halley, and explained in the Introduction to Dr.

Hutton's Logarithms, p. 110, that  $\frac{n - \frac{1}{2}l}{n + \frac{1}{2}l} \times D$  nearly,

is the number answering to the log.  $l$  of the ratio

$\frac{D}{d}$ , where  $n$  denotes the modulus .43429448, &c. of the common logarithms. But, we before found

that  $x = 62000 \times \log. \text{ of } \frac{D}{d}$ , or  $\frac{x}{62000}$  is the log. of

$\frac{D}{d}$ , which log. was denoted by  $l$  in the expression

just above, for the number whose log. is  $l$  or  $\frac{x}{62000}$ ;

substituting therefore  $\frac{x}{62000}$  for  $l$ , in the expres-

sion  $\frac{n - \frac{1}{2}l}{n + \frac{1}{2}l} \times D$ , it gives the natural number



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$$\frac{n - \frac{x}{124000}}{n + \frac{x}{124000}} \times D = d, \text{ or } \frac{124000n - x}{124000n + x} = d, \text{ the den-}$$

sity of the air at the altitude  $x$ , putting  $D=1$  the density at the surface. Now put  $124000n$  or nearly  $54000=c$ ; then  $\frac{c-x}{c+x}$  will be the density of the air at any general height  $x$ .

But, in the 5th prob. it appears that  $av^2$  denotes the resistance to the velocity  $v$ , or at the height  $x$ , for the density of air the same as at the surface, which is too great in the ratio of  $c+x$  to  $c-x$ ;

therefore  $av^2 \times \frac{c-x}{c+x}$  will be the resistance at the

height  $x$ , to the velocity  $v$ , where  $a=.00025^4$ . To this adding  $w$ , the weight of the ball, gives  $av^2 \times$

$\frac{c-x}{c+x} + w$  for the whole resistance, both from the

air and the ball's mass; consequently  $\frac{av^2}{w} \times \frac{c-x}{c+x} +$

$\frac{w}{w}$  will denote the accelerating force of the ball.

Or, if we include the small part  $\frac{w}{w}$  or 1, within

the factor  $\frac{c-x}{c+x}$ , which will make no sensible dif-

ference in the result, but be a great deal simpler

in the process, then is  $\frac{av^2 + w}{w} \times \frac{c-x}{c+x} = f$  the

accelerating force. Conseq.  $-vv = 2gf\dot{x} = 2g\dot{x}$

$\times \frac{c-x}{c+x} \times \frac{av^2 + w}{w}$ , and hence  $\frac{c-x}{c+x} \dot{x} = \frac{w}{2g} \times$

$\frac{-vv}{av^2 + w}$ , or by division,  $-\dot{x} + \frac{2c}{c+x} \dot{x} = \frac{w}{32a} \times$

$\frac{-vv}{av^2 + w}$ .

$\dot{x}^2 + \frac{w}{a}$

Now the fluent of the first side of this equation

is evidently  $-x + 2c \times \text{h. l. } (c+x)$ ; and the fluent

of the latter side, the same as in prob. 5, is  $\frac{-w}{64a}$

$\times \text{h. l. } (v^2 + \frac{w}{a})$ ; therefore the general fluential

equa. is  $-x + 2c \times \text{h. l. } (c+x) = \frac{-w}{64a} \times \text{h. l.}$

$(v^2 + \frac{w}{a})$ . But, when  $x=0$ , and  $v=v$  the initial

velocity, this becomes  $0 + 2c \times \text{h. l. } c = \frac{-w}{64a} \times \text{h. l.}$

$(v^2 + \frac{w}{a})$ ; therefore, by subtraction, the correct

fluents are  $-x + 2c \times \text{h. l. } \frac{c+x}{c} = \frac{w}{64a} \times \text{hyp. log.}$

$\frac{av^2 + w}{av^2 + w}$ ; when the first velocity  $v$  is diminished

to any less one  $v$ ; and when it is quite extinct,

the state of the fluents becomes  $-x + 2c \times \text{h. l.}$

$\frac{c+x}{c} = \frac{w}{64a} \times \text{h. l. } \frac{av^2 + w}{w}$ , for the greatest

height  $x$  ascended.

Here, in the quantity  $\text{h. l. } \frac{c+x}{c}$ , the term  $x$  is

always small in respect of the other term  $c$ ; there-

fore, by the nature of logarithms, the h. l. of

$\frac{c+x}{c}$  is nearly  $= \frac{x}{c} \text{ or } \frac{2x}{2c+x}$ ; therefore, the

above fluents become  $-x + \frac{4c^2}{2c+x} = \frac{2c^2 - x^2}{2c+x}$

$\frac{2c-x}{2c+x} = \frac{w}{64a} \times \text{h. l. } \frac{av^2 + w}{w}$ . Now the latter

side of this equation is the same value for  $x$  as was

found in the 5th problem, which therefore put  $=b$ ;

then the value of  $x$  will be easily found from the

formula  $\frac{2c-x}{2c+x} = b$ , by a quadratic equation. Or,

still easier, and sufficiently near the truth, by sub-

stituting  $b$  for  $x$  in the numerator and the denomi-

nator of  $\frac{2c-x}{2c+x}$ , then  $\frac{2c-b}{2c+b} = b$ , and hence  $x =$

$\frac{2c+b}{2c-b} b$ , or by proportion, as  $2c-b : 2c+b :: b : x$ ;

that is, only increase the value of  $x$ , found by prob-

lem 5, in the ratio of  $2c-b$  to  $2c+b$ .

Now, in the first example to that prob. the

value of  $x$  or  $b$  was there found  $=2955$ ; and  $2c$

being  $=108000$ , therefore,  $2c-b = 105045$ , and

$2c+b = 110955$ , then as  $105045 : 110955 :: 2955 :$

$3121$  is the value of the height  $x$  in this case, be-

ing only 166 feet, or  $\frac{1}{13}$ th part more than before.

Also, for the 2d example to the 5th prob. where

$x$  was  $=6420$ ; therefore as  $2c-b : 2c+b$  or as

$105345 : 110955 :: 6420 : 6780$  the height as-

cended in this example, being also the 18th part

more than before. And so on, for any other ex-

amples; the value of  $2c$  being the constant num-

ber 108000.

PROB. VIII.—To determine the time of a ball's

ascending, considering the decreasing density of

the air, as in the last prob.

The fluxion of the time  $t = \frac{\dot{x}}{v}$ . But the gene-

ral equation of the fluxions of the space  $x$  and ve-

locity  $v$ , in the last prob. was  $\frac{c-x}{c+x} \dot{x} = \frac{w}{32} \times$

$\frac{-vv}{av^2 + w}$ ; ther.  $\dot{x} = \frac{w}{32} \times \frac{c+x}{c-x} \times \frac{-v}{av^2 + w}$ ; hence

$t \text{ or } \frac{\dot{x}}{v} = \frac{w}{32} \times \frac{c+x}{c-x} \times \frac{-v}{av^2 + w}$ . But  $x$ , which is

always small in respect of  $c$ , is nearly  $=b$  as

determined in the last problem; therefore  $\frac{c+b}{c-b}$

may be substituted for  $\frac{c+x}{c-x}$  without sensible er-

ror; and then  $t$  becomes  $= \frac{w}{32} \times \frac{c+b}{c-b} \times \frac{-v}{av^2 + w}$ .

Now, this fluxion being to that in prob. 6, in the

constant ratio of  $c-b$  to  $c+b$ , their fluents will be

also in the same constant ratio. But, by the last

prob.  $c=54000$ , and  $b=2955$  for the first exam-

ple in prob. 5; therefore  $c-b=51045$ , and  $c+b=$

$56955$ , also, the time in problem 6 was  $9^m 91^s$ ;

therefore as  $51045 : 56955 :: 9^m 91^s : 11^m 04^s$  for the

time in this case, being  $1^m 13^s$  more than the for-

mer, or nearly the 9th part more; which is nearly

the double, or as the square of the difference, in

the last prob. in the height ascended.

PROB. IX.—To determine the circumstances of

X X 2

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space, time, and velocity, of a ball descending through the atmosphere by its own weight.

It is here meant that the balls are at least as heavy as cast iron, and therefore their loss of weight in the air insensible; and that their motion commences by their own gravity from a state of rest. The first object of enquiry may be, the utmost degree of velocity any such ball acquires by thus descending. Now it is manifest that the ball's motion is commenced, and uniformly increased, by its own weight, which is its constant urging force, being always the same, and producing an equal increase of velocity in equal times, excepting for the diminution of motion by the air's resistance. It is also evident that this resistance, beginning from nothing, continually increases, in some ratio, with the increasing velocity of the ball. Now, as the urging force is constantly the same, and the resisting force always increasing, it must happen that the latter will at length become equal to the former: when this happens, there can afterwards be no further acceleration of the motion, the impelling force and the resistance being equal, and the ball must ever after descend with a uniform motion. It follows therefore that, to answer the first enquiry, we have only to determine when or what velocity of the ball will cause a resistance just equal to its own weight.

Now, by inspecting the tables of resistances preceding prob. 1, particularly the 1st of the three tables, the weight of the ball being 1.05 lb. we perceive that the resistance increases in the 2d column, till 0.69 opposite to 200 velocity, and 1.56 answering to 300 velocity, between which two the proposed resistance 1.05, and the correspondent velocity, fall. But, in two velocities not greatly different, the resistances are very nearly proportional to the squares of the velocities. Therefore, having given the velocity 200 answering to the resistance 0.69, to find the velocity answering to the resistance 1.05, we must say, as 0.69 : 1.05 :: 200<sup>2</sup> : v<sup>2</sup> = 60870, therefore  $v = \sqrt{60870} = 246$ , is the greatest velocity this ball can acquire; after which it will descend with that velocity uniformly, or at least with a velocity nearly approaching to 246.

The same greatest or uniform velocity will also be directly found from the rule  $\cdot 00001725v^2 = r$ , near the end of problem 2, where  $r$  is the resistance to the velocity  $v$ , by making 1.05 =  $r$ ; for then  $v^2 = \frac{1.05}{\cdot 00001725} = 60870$ , the same value for  $v^2$  as before.

But now, for any other weight of ball; as the weights of the balls increase as the cubes of their diameters, and their resistances, being as the surfaces, increase only as the squares of the same, which is one power less; and the resistances being also in this case, as the squares of the velocities, we must therefore increase the squares of the velocity in the ratio of the diameters of the balls;

that is, as  $1.965 : d :: 246^2 : d^2$ , and hence  $v = 246 \sqrt{\frac{d}{1.965}} = 175\frac{1}{2} \sqrt{d}$ .

If we take here the 3 lb. ball, belonging to the 2d table of resistances, whose diameter  $d$  is = 2.80; then  $\sqrt{2.80} = 1.673$ , and  $175\frac{1}{2} \times 1.67 = 294$ , is the greatest or uniform velocity, with which the 3 lb. ball will descend. And if we take the 6 lb. ball, whose diameter is 3.53 inches, as in the 3d table of resistances: then  $\sqrt{3.53} = 1.88$ , and

$175\frac{1}{2} \times 1.88 = 330$ , being the greatest velocity that can be acquired by the 6 lb. ball, and with which it will afterwards uniformly descend. For a 9 lb. ball, whose diameter is 4.04, the velocity will be  $175\frac{1}{2} \times 2.01 = 353$ . And so on for any other size of iron ball, as in the following table.

| Wt. lbs. | Diam. inch. | Term. Veloc. feet. | Height due to $v$ , feet. |
|----------|-------------|--------------------|---------------------------|
| 1        | 1.94        | 244                | 930                       |
| 2        | 2.45        | 275                | 1182                      |
| 3        | 2.80        | 294                | 1260                      |
| 4        | 3.08        | 308                | 1482                      |
| 6        | 3.53        | 330                | 1701                      |
| 9        | 4.04        | 353                | 1958                      |
| 12       | 4.45        | 370                | 2139                      |
| 18       | 5.09        | 396                | 2450                      |
| 24       | 5.60        | 415                | 2691                      |
| 32       | 6.17        | 436                | 2970                      |
| 36       | 6.41        | 444                | 3080                      |
| 42       | 6.75        | 456                | 3249                      |

Where the first column contains the weight of the balls in lbs.; the 2d their diameters in inches; the 3d their velocities to which they nearly approach, as a limit, and therefore called their terminal or last velocities, with which they afterward descend uniformly; and the 4th or last column the heights due to those velocities, or the heights from which the balls must descend in vacuo to acquire them.

But it is manifest that the balls can never attain exactly to these velocities in any finite time or descent, being only the limits to which they continually approach, without ever really reaching, though they arrive very nearly at them in a short space of time; as will appear by the following calculation.

To obtain general expressions for the space descended, and the time of the descent, in terms of the velocity  $v$ : put  $x$  = any space descended,  $t$  = its time, and  $v$  the velocity acquired, the weight of the ball  $w = 1.05$  lb. Now, by the theorem near the end of prob. 2, which is the proper rule for this case, the velocity being small,  $\cdot 00001725v^2 = cv^2$  is the resistance due to the velocity  $v$ ; theref.  $w - cv^2$  is the impelling force, and

$$\frac{w - cv^2}{w} = f \text{ the accelerating force; consequently}$$

$$vv \text{ or } 2gf\dot{x} = 2g\dot{x} \times \frac{w - cv^2}{w}, \text{ and } \dot{x} = \frac{w}{2g} \times \frac{vv}{w - cv^2}, \text{ the}$$

correct fluent of which, by the 8th form, is  $x = \frac{w}{4g^c}$

$\times$  h. 1.  $\frac{w}{w - cv^2}$ , the general value of the space  $x$  descended.

Here it appears that the denominator  $w - cv^2$  decreases as  $v$  increases; conseq. the whole value of  $x$ , the descent, increases with  $v$ , till it becomes infinite, when the resistance  $cv^2$  is =  $w$  the weight of the ball, when the motion becomes uniform, as before remarked. We may, however, easily assign the value of  $x$  a little before the velocity becomes uniform, or before  $cv^2$  becomes =  $w$ . Thus, when  $cv^2 = w$ , then  $v = 246$ , as found in the beginning of this problem. Assume therefore  $v$  a little less than that greatest velocity, as for in-



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stance 240: then this value of  $v$  substituted in the general formula for  $x$  above deduced, gives  $x = 2781$  feet, a little before the motion becomes uniform, or when the velocity has arrived at 240, its maximum being 246.

In like manner is the space to be computed that will be due to any other velocity less than the greatest or terminal velocity. On the contrary, to find the velocity due to any proposed space  $x$ ,

from the formula  $x = \frac{w}{4g^c} \times \text{h. l.} \frac{v}{w - cv^2}$ . Here

$x$  is given to find  $v$ . First then  $\frac{4g^c x}{w} = \text{h. l.}$

$\frac{v}{w - cv^2}$ : take therefore the number to the hyp.

log. of  $\frac{4g^c x}{w}$ , which number call  $N$ ; then  $N =$

$\frac{w}{w - cv^2}$ ; consequently  $Nw - Ncv^2 = w$ , and  $Nw -$

$w = Ncv^2$ , and  $v = \sqrt{\frac{N - I}{NC}} w$ , a general theorem

for the value of  $v$  due to any distance  $x$ . Suppose, for instance,  $x$  is 1000. Now  $4g$  being

$= 64$ ,  $w = 1.05$ , and  $c = .00001725$ ; therf.  $\frac{4g^c x}{w}$

$= 1.0514$ , and the natural number belonging to this, considered as an hyp. log. is  $2.8617 = N$ ;

hence then  $v = \sqrt{\frac{N - I}{NC}} w = 199$ , is the velocity

due to the space 1000, or when the ball has descended 1000 feet.

Again, for the time  $t$  of descent: here  $t = \frac{x}{v}$ ;

but  $x = \frac{w}{2g} \times \frac{v}{w - cv^2}$ , as found above, therefore

$t = \frac{w}{2g} \times \frac{v}{w - cv^2}$ , the fluent of which is  $\frac{I}{4g^c} \sqrt{\frac{w}{c}}$

$\times \text{h. l.} \frac{w + v}{\frac{w}{c} - v}$ , the general value of the time  $t$

for any value of the velocity  $v$ ; which value of  $t$

evidently increases as the denominator  $\sqrt{\frac{w}{c} - v}$

decreases, or as the velocity  $v$  increases; and consequently the time is infinite when that denominator vanishes, which is when  $v = \sqrt{\frac{w}{c}}$ , or  $cv^2 = w$ ,

the resistance equal to the ball's weight, being the same case as when the space  $x$  becomes infinite, as above remarked. But, like as was done for the distance  $x$  as above, we may here also find the value of  $t$  corresponding to any value of  $v$ , less than its maximum 246, and consequently to any value of  $x$ , as when  $v$  is 240 for instance, or  $x = 2781$ , as determined above. Now, by substituting

240 for  $v$ , in the general formula  $t = \frac{I}{4g} \sqrt{\frac{w}{c}} \times \text{h. l.}$

$\frac{w + v}{\frac{w}{c} - v}$ , it brings out  $t = 16.575$ ; so that it

would be nearly  $16\frac{1}{2}$  seconds when the velocity arrives at 240, or a little less than the maximum

or uniform degree, viz. 246, or when the space descended is 2781 feet.

Also, to determine the time corresponding to the same, or when the descent is 1000 feet, or

the velocity 199: find the value of  $\frac{I}{4g} \sqrt{\frac{w}{c}} = \frac{I}{64}$

$\sqrt{\frac{1.05}{.00001725}} = \frac{246}{64} = \frac{123}{32}$ . Then

$\frac{v}{\frac{w}{c} - v} = \frac{246 + 199}{249 - 199} = \frac{445}{47}$ ; the hyp. log. of

which is  $2.2479$ . Hence  $2.2479 \times \frac{123}{32} = 8.64$ ,

the time of descending 1000 feet, or when the velocity is 199.

PROB. X.—To determine the circumstances of the motion of a ball projected horizontally in the air; abstracted from its vertical descent by its gravitation.

Putting  $d$  for the diameter, and  $w$  the weight of the ball,  $v$  the velocity of projection, and  $v$  the velocity of the ball after having moved through the space  $x$ . Then, by corol. 1 to prob. 2, if the velocity is considerable, such as usual in practice, the resistance of the ball, moving with the velocity  $v$ , is  $(mv^2 - nv)d^2$ , and therefore  $\frac{mv^2 - nv}{w}d^2$

is the retardive force  $f$ ; hence the common formula  $vv = 2gfs$ , is  $-vv = 32x \times \frac{mv^2 - nv}{w}d^2$ , and there-

fore  $x = \frac{w}{32d^2} \times \frac{-vv}{mv^2 - nv} = \frac{w}{32d^2} \times \frac{-v}{mv - n} = \frac{w}{32d^2m}$

$\times \frac{-v}{v - m}$ , the fluent of which is obviously  $\frac{w}{32md^2}$

$\times$  hyp. log. of  $v - \frac{n}{m}$ , and by the correction

by the first velocity  $v$ , it becomes  $x = \frac{w}{32md^2} \times$

hyp. log.  $\frac{v - \frac{n}{m}}{v - m}$ , the general formula for the dis-

tance passed over in terms of the velocity.

Now, for an application, let it be required first, to determine in what space a 24 lb. ball will have its velocity reduced from 1780 feet to 1500, that is, losing 280 feet of its first velocity. Here,  $d = 5.6$ ,

$w = 24$ ,  $v = 1780$ , and  $v = 1500$ ; also  $\frac{n}{m} = 150$ .

Hence  $\frac{w}{32md^2} = 3587.4$ , then  $x = 3587.4 \times \text{h. l.}$

$\frac{v - 150}{v - 150} = 3587.4 \times \text{h. l.} \frac{1630}{1350} = 3587.4 \times \text{h. l.}$

$\frac{163}{135} = 676$  feet, the space passed over when the

ball has lost 280 feet of its motion.

Again, to find with what velocity the same ball will move, after having described 1000 feet in its flight. The above theorem is  $x$  or  $1000 = 3587.4$

$\times \text{h. l.} \frac{v - 150}{v - 150} = 3587.4 \times \text{h. l.} \frac{1630}{v - 150}$ , or

$\frac{1000}{3587.4} = \text{h. l.} \frac{1630}{v - 150}$ , or

$\frac{1000}{3587.4} = \text{h. l.} \frac{1630}{v - 150}$ , or

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$\frac{1000}{3587.4} = \text{h. l.} \frac{1630}{v - 150}$ , or

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= h. l.  $\frac{1630}{v-150}$ ; but the number to the hyp. log.

$\frac{10000}{35374}$  is  $1.7416 = N$  suppose; then  $N = \frac{1630}{v-150}$ ,

and  $Nv - 150N = 1630$ , or  $Nv = 1630 + 150N$ , and

$v = \frac{1630}{N} - 150 = 936 - 150 = 786$ , the velocity

when the ball has moved 1000 feet.

Next, to find a theor. for the time of describing any space, or destroying any velocity: here  $\dot{x} =$

$\frac{\dot{x}}{v} = \frac{w}{32nd^2} \times \frac{v-n}{v-\frac{n}{m}}$  the fluent of which, by

the 9th form, is  $t = \frac{w}{32nd^2} \times \frac{m}{n} \times \text{h. l. } \frac{v}{v-\frac{n}{m}}$

$= \frac{w}{32nd^2} \times \text{hyp. log. } \frac{v}{v-\frac{n}{m}}$ , and by correction

$t = \frac{w}{32nd^2} \times (\text{h. l. } \frac{v}{v-\frac{n}{m}} - \text{h. l. } \frac{v}{v-\frac{n}{m}}) = \frac{w}{32nd^2} \times$

$\text{hyp. log. } \frac{v-150}{v-150} \cdot \frac{v}{v}$ , putting  $v$  for the first velocity, and 150 for  $\frac{n}{m}$  its value, as before.

Now, to take for an example the same 24 lb. ball, and its projected velocity 1780, as before; let it be required to find in what time this velocity will be reduced to 786. Here then  $v = 1780$ ,  $v = 786$ ,  $w = 24$ ,  $d = 5.6$ ,  $d^2 = 31.36$ ,  $n = .001$ ; hence

$\frac{w}{32nd^2} = \frac{750}{31.36} = 23.916$ ; and  $\frac{v-150}{v-150} \cdot \frac{v}{v} = \frac{1630}{630}$

$\times \frac{786}{1780} = \frac{21353}{18368}$ , the hyp. log. of which is .1099; then  $31.36 \times .1099 = 2.628$ , the time required.

For another example, let it be required to find when the velocity will be reduced to 1000, or 780 destroyed. Here  $v = 1000$ , and all the other quantities as before. Then  $\frac{v-150}{v-150} \times \frac{v}{v} = \frac{1630}{850}$

$\times \frac{1000}{1780} = \frac{1630}{1513}$ , the hyp. log. of which is .07449; therefore  $31.36 \times .07449 = 1.78$ , is the time sought.

On the other hand if it be required to find what will be the velocity after the ball has been in motion during any given time, as suppose two seconds, we must reverse the calculation thus:

$t = 2$  being  $\frac{w}{32nd^2} \times \text{hyp. log. } \frac{v-150}{v-150} \cdot \frac{v}{v} =$

$23.916 \times \text{hyp. log. } \frac{v-150}{v-150} \cdot \frac{v}{v}$ ; theref.  $23.916$

$= .08356$  is the hyp. log. of  $\frac{v-150}{v-150} \cdot \frac{v}{v}$ , the

number answering to which is  $1.08725 = N$  sup-

pose, that is,  $N = \frac{v-150}{v-150} \cdot \frac{v}{v}$ . Hence  $Nv - 150N =$

$150Nv = v^2 - 150v$ , and  $v = \frac{150Nv}{150 + Nv - v}$

$\frac{290290}{305305} = 951$ , the velocity at the end of two seconds.

The foregoing calculations serve only for the higher velocities, such as exceed 200 or 300 feet per second of time. But, for those that are below 300, the rule is simpler, as the resistance is then, by cor. 2. prob. 2.  $.00000447d^2v^2 = cd^2v^2$ , where  $d$  denotes the diameter of any ball. Hence

then, employing the same notation as before,  $\frac{cd^2v^2}{w}$

$= f$ , and  $-v\dot{v} = 32fx = 32x \times \frac{cd^2v^2}{w}$ ; theref.  $\dot{x} =$

$\frac{w}{32cd^2} \times \frac{v}{v}$ , the correct fluent of which is  $x =$

$\frac{w}{32cd^2} \times \text{hyp. log. } \frac{v}{v}$ .

Now, for an example, suppose the first velocity to be 300 =  $v$ , and the last  $v = 100$ , for a 24 lb. ball. Then  $w = 24$ ,  $d = 5.6$ ,  $d^2 = 31.36$ ,  $c =$

$.00000447$ ; therefore  $\frac{w}{32cd^2} = \frac{3}{125.446} = 5350$ ;

and  $\frac{v}{v} = \frac{300}{100} = 3$ , the hyp. log. of which is .10986; therefore  $.10986 \times 5350 = 5878 = x$ , is the distance. If the first velocity be only 200

$= v$ ; then  $\frac{v}{v} = 2$ , the h. l. of which is .69315,

therefore  $.69315 \times 5350 = 3708 = x$ , the distance.

And conversely, to find what velocity will remain after passing over any space, as 4000 feet, the first velocity being  $v = 200$ . Here the hyp.

log. of  $\frac{v}{v}$  is  $\frac{x}{5350} = \frac{4000}{5350} = \frac{400}{535} = \frac{80}{107} =$

.74766, the natural number of which is 2.1120,

that is,  $2.112 = \frac{v}{v}$ ; therefore  $v = \frac{200}{2.112} =$

947, the velocity.

Again, for the time  $t$ : since  $\dot{x} = \frac{w}{32cd^2} \times \frac{v}{v}$ ,

therefore  $t = \frac{\dot{x}}{v} = \frac{w}{32cd^2} \times \frac{v}{v^2}$ , the correct flu-

ent of which is

$t = \frac{w}{32cd^2} \times (\frac{1}{v} - \frac{1}{v}) = \frac{w}{32cd^2} \times \frac{v-v}{vv}$ . So,

for example, if  $v = 300$ , and  $v = 100$ , then  $\frac{v-v}{vv} =$

$= \frac{200}{30000} = \frac{2}{300}$ ; then  $\frac{w}{32cd^2}$  or  $5350 \times \frac{2}{300}$

$= 35.66 = t$ , the time of reducing the 300 velocity to 100, or of passing over the space 5878 feet.

And reversing, to find the velocity  $v$ , answering to any given time  $t$ : Since

$t = \frac{w}{32cd^2} \times (\frac{1}{v} - \frac{1}{v}) = 5350 \times (\frac{1}{v} - \frac{1}{v})$ ,

therefore  $v = \frac{5350}{5350 + tv}$ . Here, if  $t$  be given



# PROJECTILES.

$= 30''$ , and  $v = 300$ ; then  $v = \frac{5350v}{5350 + 9000}$   
 $= \frac{535}{1435} \times 300 = \frac{32100}{287} = 112$ , the velocity sought.

Corol. The same form of theorem,  $x = \frac{v}{3200a^2}$

$\times \text{hyp. log. } \frac{v}{v}$ , as above, is brought out for small velocities, will also serve for the higher ones, if we employ the medium resistance between the two proposed velocities, as was done in prob. 5. Thus, as in the first example of this problem, where the two velocities are 1780 and 1500, the resistance due to the velocity 1700, in the first table of resistances, being 74.13, say as 1700<sup>2</sup> : 1780<sup>2</sup> :: 74.13 : 81.27, the resistance due to the velocity 1780; then the mean between 81.27 and 57.25, due to 1500 velocity, is 69.26, or rather take 69½. Again, as  $\sqrt{65.7} : \sqrt{69.5} :: 1690 : 1646$ , the velocity due to the medium resistance 69½. Hence, as in prob. 5, as 1646<sup>2</sup> : v<sup>2</sup> :: 69½ : .00002565v<sup>2</sup> = suppose av<sup>2</sup>, the resistance due to any velocity v, between 1780 and 1500, for the 1.05 lb. ball. And, as 1965<sup>2</sup> : 5.6<sup>2</sup> :: av<sup>2</sup> : 8.124av<sup>2</sup> = .0002038v<sup>2</sup> = bv<sup>2</sup> suppose, the resistance due to the same velocity with the 24 lb. ball.

Therefore  $\frac{bv^2}{24} = f$ , and  $-vv = 32f \dot{x} = \frac{4}{3}bv^2 \dot{x}$ , and  $\dot{x} =$

$-\frac{3v}{4bv}$ , the correct fluent of which is  $\frac{3}{4b} \times \text{hyp. log.}$

$$\frac{v}{v} = \frac{3}{4b} \times \text{hyp. log. } \frac{178}{150} = \frac{3}{4b} \times \text{hyp. log.}$$

$$\frac{89}{75} = 3600 \times .171148 = 616 \text{ the velocity sought.}$$

PROB. XI.—To determine the ranges of projectiles in the air.

To determine, by theory, the trajectory a projectile describes in the air, is one of the most difficult problems in the whole course of dynamics, even when assisted by all the experiments that have hitherto been made on this branch of physics; and is indeed much too difficult for this place, in the full extent of the problem: the consideration of it must therefore be reserved for another occasion, when the nature of the air's resistance may be more amply discussed. Even the solutions of Newton, of Bernoulli, of Euler, of Borda, &c. &c. after the most elaborate investigations, assisted by all the resources of the modern analysis, amount to no more than distant approximations, that are rendered nearly useless, even to the speculative philosopher, from the assumption of a very erroneous law of resistance in the air, and much more so to the practical artilleryman, both on that account, and from the very intricate process of calculation, which is quite inapplicable to actual service. The solution of

this problem requires, as an indispensable datum, the perfect determination, by experiment, of the nature and laws of the air's resistance at different altitudes, to balls of different sizes and densities, moving with all the usual degrees of celerity.

All that can be here done then, in the solution of the present problem, besides what is delivered in the 2d volume, is to collect together some of the best practical rules, founded partly on theory, and partly on practice. 1. In the first place then, it may be remarked, that the initial or first velocity of a ball may be directly computed by problem 17, near the end of the 2d volume; having given the dimensions of the piece, the weight of the ball, and the charge of powder. Or otherwise, the same may be made out from the table of experimented ranges and velocities in p. 161 of that volume, by this rule, that the velocities to different balls, and different charges of powder, are as the square roots of the weights of the powder directly, and as the square roots of the weights of the balls inversely. Thus, if it be enquired with what velocity a 24 lb. ball will be discharged by 8 lb. of powder. Now it appears in the table, that 8 ounces of powder discharge the 1 lb. ball with 1640 feet velocity; and because 8 lb. are = 128 ounces; therefore by the rule, as  $\sqrt{8} : \sqrt{128} :: 1640 : 1640\sqrt{\frac{16}{24}} = 1640\sqrt{\frac{2}{3}} = 1339$ , the velocity sought. Or otherwise, by rule I, p. 162, of the 2d vol. as  $\sqrt{24} : \sqrt{16} :: 1600 : 1306$ , the same velocity nearly. But when the charges bear the same ratio to one another, as the weight of the balls, that is when the pieces are said to be alike charged, then the velocities will be equal. Thus, the 1 lb. ball by the 2 oz. charge, being the 8th part of the weight, and the 24 lb. ball, with 3 lb. of powder, its 8th part also, will have the same velocity, viz. 860 feet. In like manner, the 1230 tabular velocity, answering to 4 oz. of powder, the 4th part of the ball, will equally belong to the 24 lb ball with 6 lb. of powder, being its 4th part, and the tabular velocity 1640, answering to the 8 oz. charge, which is  $\frac{1}{2}$  the weight of ball, will equally belong to the 24 lb. ball with 12 lb. of powder, being also the  $\frac{1}{2}$  of its weight.

2. By prob. 9 will be found what is called the terminal velocity, that is, the greatest velocity a ball can acquire by descending in the air; indeed a table is there given of the several terminal velocities belonging to the different balls, with the heights, in an annexed column, due to those velocities in vacuo, that is the heights from which a body must fall in vacuo, to acquire those velocities.

3. Given the initial velocity, to find the elevation of the piece to have the greatest range, and the extent of that range. These will be found by means of the following table, altered from professor's Robson's, in the Encyclopædia Britannica, and founded on an approximation of sir I. Newton's. The numbers in the first column, multiplied by the terminal velocity of the ball, give the initial velocity; and the numbers in the last column, being multiplied by the height, give the greatest ranges; the middle column showing the elevations to produce those ranges.

# PROJECTILES.

| Table of elevations giving the greatest range. |           |                     |
|------------------------------------------------|-----------|---------------------|
| Initial vel.<br>div. by v.                     | Elevation | Range div.<br>by a. |
| 0.6910                                         | 44° 0'    | 0.3914              |
| 0.9445                                         | 43 15     | 0.5850              |
| 1.1980                                         | 42 30     | 0.7787              |
| 1.45 5                                         | 41 45     | 0.9 24              |
| 1.7050                                         | 41 0      | 1.166               |
| 1.9585                                         | 40 15     | 1.3598              |
| 2.2120                                         | 39 30     | 1.5535              |
| 2.4655                                         | 38 45     | 1.7472              |
| 2.7190                                         | 38 0      | 1.9409              |
| 2.9725                                         | 37 15     | 2.1346              |
| 3.2260                                         | 36 30     | 2.3283              |
| 3.4795                                         | 35 45     | 2.5220              |
| 3.7330                                         | 35 0      | 2.7157              |
| 3.9865                                         | 34 15     | 2.9094              |
| 4.2400                                         | 33 30     | 3.1031              |
| 4.4935                                         | 32 45     | 3.2968              |
| 4.7470                                         | 32 0      | 3.4905              |
| 5.0000                                         | 31 15     | 3.6842              |

To use this table then, divide the given initial velocity by the terminal velocity peculiar to the ball, found in the table in prob. 9, and look for the quotient in the first column here annexed. Against this, in the 2d column will be found the elevation to give the greatest range; and the number in the 3d column multiplied by *a*, the altitude due to the terminal velocity, also found

in the table in problem 9, will give the range, nearly.

*Exam. 1.* Let it be required to find the greatest range of a 24lb. ball, when discharged with 1640 feet velocity, and the corresponding angle to produce that range. By the table in prob. 9, the terminal velocity of the 24lb. ball is 415, and its

producing altitude 2691: hence  $\frac{1640}{415} = 3.95$ , nearly

equal to 3.9865 in the first column of our table, to which corresponds the angle 34° 15', being the elevation to produce the greatest range; and the corresponding number 2.9094, in the 3d column, multiplied by 2691, gives 7829 feet, for the greatest range, being nearly a mile and a half.

*Exam. 2.* In like manner, the same ball discharged with the velocity 860 feet, will have for its greatest range 3891 feet, or nearly  $\frac{3}{4}$  of a mile, and the elevation producing it 39° 55'.

These examples, and indeed the whole table in the 9th problem, are only adapted to the use of cannon balls. But it is not usual, and indeed not easily practicable, to discharge cannon shot at such elevations, in the British service, that practice being the peculiar office of mortar shells. On this account then it will be necessary to make out a table of terminal velocities, and altitudes due to them, for the different sizes of such shells. The several kinds of these in present use are denominated from the diameters of their mortar bores in inches, being the five following. viz. the 4, 6, the 5, 8, the 8, the 10, and the 13 inch mortars, as in the first column of the following table. But the outer diameters of the shell are somewhat smaller, to leave a little room or space as windage, as contained in the 2d column.

| Table of dimensions, &c. of mortar shells. |                  |                          |                        |                          |                    |                               |
|--------------------------------------------|------------------|--------------------------|------------------------|--------------------------|--------------------|-------------------------------|
| Diam. of mortar.                           | Diam. of shells. | Weight of shells filled. | Weight of equal solid. | Ratio of shell to solid. | Terminal velocity. | Alt. <i>a</i> . due to veloc. |
| inch.                                      | inch.            | lbs.                     | lbs.                   |                          | feet.              | f. et.                        |
| 4.6                                        | 4.53             | 9                        | 12 $\frac{3}{4}$       | 1.42                     | 314                | 1541                          |
| 5.8                                        | 5.72             | 18                       | 25 $\frac{1}{2}$       | 1.42                     | 352                | 1936                          |
| 8                                          | 7.90             | 47                       | 67                     | 1.42                     | 414                | 2678                          |
| 10                                         | 9.84             | 91 $\frac{1}{2}$         | 130                    | 1.42                     | 462                | 3335                          |
| 13                                         | 12.80            | 201                      | 286                    | 1.42                     | 527                | 4340                          |

The 3d column contains the weight of each shell when the hollow part is filled with powder: the diameter of the hollow is usually  $\frac{7}{8}$  of that of the mortar. The weight of the shells empty, and when filled, with other circumstances, may be seen at quest 53, p. 265, vol. 2. On account of the vacuity of the shell being filled only with gunpowder, the weight of the whole so filled, and contained in column 3, is much less than the weight of the same size of solid iron, and the corresponding weights of such equal solid balls are contained in col. 4. The ratio of these weights, or the latter divided by the former, occupies the 5th column.

Now, because the loaded or filled shells are of less specific gravity, or less heavy, than the equal solid iron balls, in the ratio of 1 to 1.42, as in column 5, the former will have less power or force to oppose the resistance of the air, in that same proportion, and the terminal or greatest velocity, as determined in the 9th problem; will be correspondently less. Therefore, instead of

the rule there given, viz.  $175.5\sqrt{d}$ , for that ve-

locity, the rule must now be  $175.5\sqrt{\frac{d}{1.42}} = 147.3$

$\sqrt{d} = v$ , the diameter of the shell being *d*; that is, the terminal velocities will be all less in the ratio of 147.3 to 175.5. Now, computing these several velocities by this rule, to all the different diameters, they are found as placed in the 6th column; and in the 7th or last column are set the altitudes which would produce these velocities

in vacuo, as computed from this theorem  $\frac{vv}{64}$ .

Having now obtained these terminal velocities, and their producing altitudes, for the shells, we can, from them and the former table of ranges and elevations, easily compute the greatest range, and the corresponding angle of elevation, for any mortar and shell, in the same way as was done for the balls in this problem. Thus, for example, to find the greatest range and elevation for the 13 inch shell, when projected with the velocity



of 2000 feet per second, being nearly the greatest velocity that balls can be discharged with. Now, by the method before used,  $\frac{2000}{527} = 3.796$ ; oppo-

site to this, found in the first column of the table of ranges, corresponds  $34^{\circ} 49'$  for the elevation in the 2d column, and the number 2.764 in the 3d column; this multiplied by the altitude 4340, gives 11995 feet, or more than  $2\frac{1}{2}$  miles, for the greatest range.

This however is much short of the distance which it is said the French have lately thrown some shells at the siege of Cadiz. viz. 3 miles, which it seems has been effected by means of a peculiar piece of ordnance and by loading or filling the cavity of the shell with lead, to render it heavier, and thus make it fitter to overcome the resistance of the air. Let us then examine what will be the greatest range of our 13 inch shell, if its usual cavity be quite filled with lead when discharged with the projectile velocity of 2000 feet.

Now the diameter of the cavity, being about  $\frac{7}{10}$  of that of the mortar 13, will be nearly 9 inches. And the weight of a globe of lead of this diameter is 139 3lb.; which added to 187.8, the weight of the shell empty, gives 327 lb. the whole weight of the shell when the cavity is filled with lead, which was found 286 when supposed all of solid iron, their ratio or quotient is .8783. Then,

as before, the theorem will be  $175.5\sqrt{\frac{d}{.8783}} = 1873\sqrt{d}$  for the terminal velocity; which, when  $d=12.8$ , becomes 670 for the terminal velocity;

therefore its producing altitude is  $\frac{670^2}{64} = 7014$ .

Then, by the same method as before,  $\frac{2000}{670} =$

2.985; which number, found in the first column of the table of ranges, the opposite number in the 2d col. is  $37^{\circ} 15'$  for the elevation of the piece, and in the 3d column 2.14, multiplied by 7014, gives 15010 feet, or nearly 3 miles. So that our 13 inch shells, discharged at an elevation of about  $37\frac{1}{2}$  degrees, would range nearly the distance mentioned by the French, when filled with lead, if they can be projected with so much as 2000 feet velocity, or upwards. This however it is thought cannot possibly be effected by our mortars; and that it is therefore probable the French, to give such a velocity to those shells, must have contrived some new kind of large cannon on the occasion.

4. Having shown in the preceding articles and problems, how, from our theory of the air's resistance, can be found, first the initial or projectile velocity of shot and shells; 2dly, the terminal velocity, or the greatest velocity a ball can acquire by descending by its own weight in the air; 3dly, the height a ball will ascend to in the air, being projected vertically with a given velocity, also the time of that ascent; 4thly, the greatest horizontal ranges of given shot, projected with a given velocity; as also the particular angle of elevation of the piece, to produce that greatest range. It remains then now to enquire, what laws and regulations can be given respecting the ranges, and times of flight, of projects made at other angles of elevation.

Relating to this enquiry, the Encyclopædia Britannica mentions the two following rules:

1st, "Balls of equal density, projected with the same elevation, and with velocities which are as the square roots of their diameters, will describe similar curves. This is evident, because, in this case, the resistance will be in the ratio of their quantities of motion; therefore all the homologous lines of the motion will be in the proportion of the diameters." But though this may be nearly correct, yet it can hardly ever be of any use in practice, since it is usual and proper to project small balls, not with a less, but with a greater velocity, than the larger ones. 2dly, the other rule is, "If the initial velocities of balls, projected with the same elevation, be in the inverse subduplicate ratio of the whole resistances, the ranges, and all the homologous lines in their track, will be inversely as those resistances." This rule will come to the same thing, as having the initial velocities in the inverse ratio of the diameters, as distant perhaps from fitness as the former. Two tables are next given in the same place, for the comparison of ranges and projectile velocities, the numbers in which appear to be much wide of the truth, as depending on very erroneous effects of the resistance. Most of the accompanying remarks, however, are very ingenious, judicious, and philosophical, and very justly recommending the making and recording of good experiments on the ranges and times of flight of projects, of various sizes, made with different velocities, and at various angles of elevation.

Besides the above, we find rules laid down by Mr. Robins and Mr. Simpson, for computing the circumstances relating to projectiles as affected by the resistance of the air. Those of the former respectable author, in his ingenious *Tracts on Gunnery*, being founded on a quantity which he calls  $r$  (answering to our letter  $a$  in the foregoing pages), almost uniformly double of what it ought to be, owing to his improper measures of the air's resistance; and therefore the conclusions derived by means of those rules must needs be very erroneous. Those of the very ingenious Mr. Simpson, contained in his *Select Exercises*, being partly founded on experiment, may bring out conclusions in some of the cases not very incorrect; while some of them, particularly those relating to the impetus and the time of flight, must be very wide of the truth. We must therefore refer the student, for more satisfaction, to the rules and examples given by Dr. Hutton in vol. 2, p. 162, &c. Course of Mathematics, especially for the circumstances of different ranges and elevations, &c. after having determined, as above, those for the greatest ranges, founded on the real measure of the resistances.

PROJECTION. *s.* (from *project.*) 1. The act of shooting forward (*Brown*). 2. (*projection*, French.) Plan; delineation (*Watts*). 3. Scheme; plan of action. 4. In chemistry, crisis of an operation (*Bacon*).

PROJECTION, in mechanics, the act of giving a projectile its motion.

If the direction of the force, by which the projectile is put in motion, is perpendicular to the horizon, the projection is said to be perpendicular; if parallel to the apparent horizon, it is said to be an horizontal projection; and if it makes an oblique angle with the horizon, the projection is oblique. In all cases, the angle which the line of direction makes with the ho-

# PROJECTION.

horizontal line, is called the angle of elevation of the projectile, or of depression when the line of direction points below the horizontal line.

**PROJECTION**, in perspective, denotes the appearance or representation of an object on the perspective plane. So, the projection of a point, is a point where the optic ray passes from the objective point through the plane to the eye; or it is the point where the plane cuts the optic ray. And hence it is easy to conceive what is meant by the projection of a line, a plane, or a solid.

**PROJECTION OF THE SPHERE IN PLANO**, is a representation of the several points or places of the surface of the sphere, and of the circles described upon it, upon a transparent plane placed between the eye and the sphere, or such as they appear to the eye placed at a given distance. For the laws of this projection, see **PERSPECTIVE**; the projection of the sphere being only a particular case of perspective.

The chief use of the projection of the sphere, is in the construction of planispheres, maps, and charts; which are said to be of this or that projection, according to the several situations of the eye, and the perspective plane, with regard to the meridians, parallels, and other points or places to be represented.

The most usual projection of maps of the world, is that on the plane of the meridian, which exhibits a right sphere; the first meridian being the horizon. The next is that on the plane of the equator, which has the pole in the centre, and the meridians the radii of a circle, &c. and this represents a parallel sphere. See **MAP**.

The projection of the sphere is usually divided into orthographic and stereographic; to which may be added gnomonic.

**PROJECTION (Orthographic)**, is that in which the surface of the sphere is drawn upon a plane cutting it in the middle; the eye being placed at an infinite distance vertically to one of the hemispheres. And,

**PROJECTION (Stereographic)**, of the sphere, is that in which the surface and circles of the sphere are drawn upon the plane of a great circle, the eye being in the pole of that circle.

**PROJECTION (Gnomonical)** of the sphere, is that in which the surface of the sphere is drawn upon a plane without side of it, commonly touching it, the eye being at the centre of the sphere. See **DIALLING**.

*Laws of the orthographic projection.*—1. The rays coming from the eye, being at an infinite distance, and making the projection, are parallel to each other, and perpendicular to the plane of projection.

2. A right line perpendicular to the plane of projection, is projected into a point where that line meets the said plane. Fig. 2. pl. 146.

3. A right plane, as AB, or CD, not perpendicular, but either parallel or oblique to the plane of the projection, is projected into a right line, as EF or GH, and is always comprehended between the extreme perpendiculars AE and BF, or CG and DH.

4. The projection of the right line AB is the greatest, when AB is parallel to the plane of the projection.

5. Hence it is evident, that a line parallel to the plane of the projection, is projected into a right line equal to itself; but a line that is oblique to the plane of projection, is projected into one that is less than itself. Fig. 5.

6. A plane surface, as ACBD, perpendicular to the plane of the projection, is projected into the right line, as AB, in which it cuts that plane. Hence it is evident, that the circle ACBD perpendicular to the plane of projection, passing through its centre, is projected into that diameter AB in which it cuts the plane of the projection. Also any arch as Cc is projected into Oo, equal to ca, the right sine of that arch; and the complementary arc cB is projected into oB, the versed sine of the same arc cB.

7. A circle parallel to the plane of the projection, is projected into a circle equal to itself, having its centre the same with the centre of the projection, and its radius equal to the cosine of its distance from the plane. And a circle-oblique to the plane of the projection, is projected into an ellipsis, whose greater axis is equal to the diameter of the circle, and its less axis equal to double the cosine of the obliquity of the circle to a radius equal to half the greater axis.

*Properties of the stereographic projection.*—

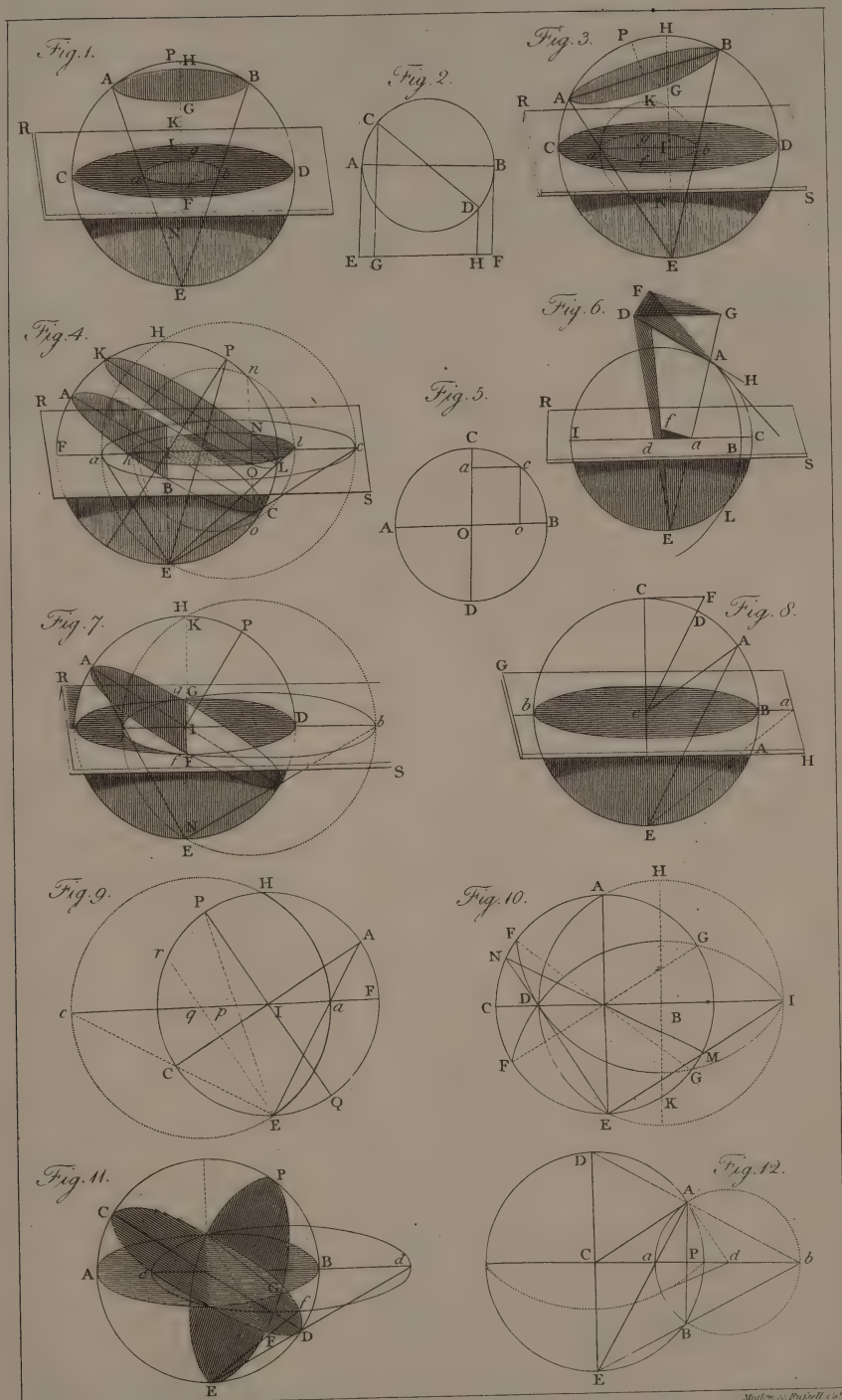
1. In this projection a right circle, or one perpendicular to the plane of projection, and passing through the eye, is projected into a line of half-tangents.

2. The projections of all other circles, not passing through the projecting point, whether parallel or oblique, are projected into circles. Figs. 1, 3, 7.

Thus, let ACEDB represent a sphere, cut by a plane RS, passing through the centre I, perpendicular to the diameter EH, drawn from E the place of the eye; and let the section of the sphere by the plane RS be the circle CFDL, whose poles are H and E. Suppose now AGB is a circle on the sphere to be projected, whose pole most remote from the eye is P; and the visual rays from the circle HGB meeting in E, form the cone AGBE, of which the triangle AEB is a section through the vertex E, and diameter of the base AB, then will the figure agbf, which is the projection of the circle AGB, be itself a circle. Hence, the middle of the projected diameter is the centre of the projected circle, whether it is a great circle or a small one: also the poles and centres of all circles parallel to the plane of projection, fall in the centre of the projection: and all oblique great circles cut the primitive circle in two points diametrically opposite.

3. The projected diameter of any circle subtends an angle at the eye equal to the distance of that circle from its nearest pole, taken on the sphere; and that angle is bisected by a right line joining the eye and that pole. Thus, let the plane RS (fig. 4.) cut the sphere HFEC through its centre I; and let ABC be any





Mathew & Piffell 1852





oblique great circle, whose diameter AC is projected into *ac*; and KOL any small circle parallel to ABC, whose diameter KL is projected in *kl*. The distances of those circles from their pole P, being the arcs AHP, KHP, and the angles *aEc*, *kEl*, are the angles at the eye, subtended by their projected diameters, *ac* and *kl*. Then is the angle *aEc* measured by the arc AHP, and the angle *kEl* measured by the arc KHP; and those angles are bisected by EP.

3. Any point of a sphere is projected at such a distance from the centre of projection, as is equal to the tangent of half the arc intercepted between that point and the pole opposite to the eye, the semidiameter of the sphere being radius. Thus, let C<sub>1</sub>EB (fig. 8.) be a great circle of the sphere, whose centre is *c*; GH the plane of projection cutting the diameter of the sphere in *b* and B; also E and C the poles of the section by that plane; and *a* the projection of A. Then *ca* is equal to the tangent of half the arc AC, as is evident by drawing CF = the tangent of half that arc, and joining cF.

4. The angle made by two projected circles, is equal to the angle which these circles make on the sphere. For let IACE (fig. 6.) and ABL be two circles on a sphere intersecting in A; E the projecting point; and RS the plane of projection, in which the point A is projected in *a*, in the line IC, the diameter of the circle ACE. Also let DH and FA be tangents to the circles ACE and ABL. Then will the projected angle *daf* be equal to the spherical angle BAC.

5. The distance between the poles of the primitive circle and an oblique circle, is equal to the tangent of half the inclination of those circles; and the distance of their centres is equal to the tangent of their inclination, the semidiameter of the primitive being radius. For let AC (fig. 9.) be the diameter of a circle, whose poles are P and Q, and inclined to the plane of projection in the angle AIF; and let *a*, *c*, *p*, be the projections of the points A, C, P; also let HaE be the projected oblique circle, whose centre is *g*. Now when the plane of projection becomes the primitive circle, whose pole is I, then is *Ip* = tangent of half the angle AIF, or of half the arch AF; and *Iq* = tangent of AF, or of the angle FHa = AIF.

6. If through any given point in the primitive circle, an oblique circle is described, then the centres of all other oblique circles passing through that point, will be in a right line drawn through the centre of the first oblique circle, and perpendicular to a line passing through that centre, the given point, and the centre of the primitive circle. Thus, let GACE (fig. 10.) be the primitive circle, and ADEI a great circle described through D, its centre being B. HK is a right line drawn through B, perpendicular to a right line CI passing through D and B and the centre of the primitive circle. Then the centres of all other

great circles, as FDH, passing through D, will fall in the line HK.

7. Equal arcs of any two great circles of the sphere will be intercepted between two other circles drawn on the sphere through the remotest poles of those great circles. For let PBEA (fig. 11) be a sphere, on which AGB and CFD are two great circles, whose remotest poles are E and P; and through these poles let the great circle PBEC and the small circle PGE be drawn, cutting the great circles AGB and CFD in the points B, G, D, F. Then are the intercepted arcs BG and DF equal to one another.

8. If lines are drawn from the projected pole of any great circle, cutting the peripheries of the projected circle and plane of projection, the intercepted arcs of those peripheries are equal; that is, the arc BG = *df*.

9. The radius of any lesser circle, whose plane is perpendicular to that of the primitive circle, is equal to the tangent of that lesser circle's distance from its pole; and the secant of that distance is equal to the distance of the centres of the primitive and lesser circle. For let P (fig. 12) be the pole and AB the diameter of a lesser circle, its plane being perpendicular to that of the primitive circle, whose centre is C: then *d* being the centre of the projected lesser circle, *da* is equal to the tangent of the arc PA, and *dC* = the secant of PA.

The above is merely a general view of this subject: they who want to go farther into it, may advantageously consult Emerson's treatise on Projection, that in Robertson's Navigation, that in bishop Horsley's Elementary Treatises, and those in Lacaille's and Vince's Astronomy, and a very elegant one in Puissant's *Traite de Topographie, d'Arpentage, et de Nivellement*.

PROJECTOR. *s.* (from *project*.) 1. One who forms schemes and designs (*Addison*). 2. One who forms wild impracticable schemes (*Pope*).

PROJECTION. *s.* (*projeture*, Fr. *pro-jectura*, Lat.) A jutting out.

To PROIN. *v. a.* (a corruption of *prune*.) To lop; to cut; to trim; to prune (*Ben Jonson*).

PROLAPSUS. (from *prolabor*, to slip down.) A protrusion. A genus of disease in the class locales, and order ectopix of Cullen; distinguished by the falling down of a part that is uncovered.

To PROLATE. *v. a.* (*prolatum*, Lat.) To pronounce; to utter (*Howel*).

PROLATE. *a.* (*prolatus*, Latin.) Extended beyond an exact round (*Cheyne*).

PROLATE, in geometry, an epithet applied to a spheroid produced by the revolution of a semi-ellipsis about its larger diameter.

PROLATION. *s.* (*prolatus*, Latin.) 1. Pronunciation; utterance (*Ray*). 2. Delay; act of deferring (*Ainsworth*).

PROLATION, in music. A method used in the old music of determining the power of semibreves and minims. The mark of prola-

## PRO

tion was placed after the cliff, and sometimes after the sign of the mode, by a circle, or semicircle, punctuated, or unpunctuated, according to the following rules: the prolation was divided into perfect and imperfect, and each into major or minor, in the same manner as the mode.

The perfect prolation was for the ternary measure, and was marked by a point in a circle when major, and by a point in a semicircle when minor.

The imperfect prolation was for the binary measure, and was marked by a single circle when major, and by a semicircle when minor.

**PROLEGOMENA.** *s.* (*προλογισματα*.) Previous discourse; introductory observations.

**PROLEPSIS.** *s.* (*προληψις*.) 1. A form of rhetoric, in which objections are anticipated (*Bramhall*). 2. An error in chronology by which events are dated too early (*Theobald*).

**PROLEPTICAL.** *a.* (from *prolepsis*.) Previous; antecedent (*Glänville*).

**PROLEPTICALLY.** *ad.* (from *proleptical*.) By way of anticipation (*Clarissa*).

**PROLETARIAN.** *a.* Mean; wretched; vile; vulgar (*Hudibras*).

**PROLIFEROUS STEM.** In botany. *Explicis centro tantum emittens ramos.* Putting forth branches only from the centre of the top: as in pinus.—Proliferous flower.—*E centro floris alium protrudens.*—*Cum intra florem (sepius plenum) alii flores enascuntur.* Having smaller flowers growing out of the principal one: as in chiding daisy.—Proliferous umbel. *Plusquam decomposita.* Every compound umbel is twice divided. In a proliferous umbel, the umbellule is subdivided.

**PROLIFICATION.** *s.* (*proles* and *facio*, Latin.) Generation of children (*Brown*).

**PROLIFICAL.** **PROLIFIC.** *a.* (*prolificus*, Fr.) Fruitful; generative; pregnant; productive (*Dryden*).

**PROLIFICALLY.** *ad.* (from *prolific*.) Fruitfully; pregnantly.

**PROLIX.** *a.* (*prolixus*, Latin.) 1. Long; tedious; not concise (*Digby*). 2. Of long duration (*Ayliffe*).

**PROLIXIOUS.** *a.* (from *prolix*.) Dilatory; tedious; not used (*Shakspeare*).

**PROLIXITY.** *s.* (*prolixité*, French.) Tediousness; tiresome length; want of brevity (*Boyle*).

**PROLIXLY.** *ad.* (from *prolix*.) At great length; tediously (*Dryden*).

**PROLIXNESS.** *s.* (from *prolix*.) Tediousness.

**PROLOCUTOR.** *s.* (Lat.) The foreman; the speaker of a convocation (*Swift*).

**PROLOCUTORSHIP.** *s.* (from *prolocutor*.) The office or dignity of prolocutor.

**PROLOGUE.** *s.* (*προλογος*.) 1. Preface; introduction to any discourse or performance (*Milton*). 2. Something spoken before the entrance of the actors of a play (*Shakspeare*).

**To PROLOGUE.** *v. a.* (from the noun.) To introduce with a formal preface (*Shakspeare*).

**To PROLONG.** *v. a.* (*prolonger*, French.)

## PRO

1. To lengthen out; to continue; to draw out (*Milton*). 2. To put off to a distant time (*Shakspeare*).

**PROLONGATION.** *s.* (*prolongation*, Fr.) 1. The act of lengthening (*Bacon*). 2. Delay to a longer time (*Bacon*).

**PROLUSION.** *s.* (*prolusio*, Latin.) Entertainments; performance of diversion (*Hake-will*).

**PROME**, a city of Pegu, capital of a province of the same name. It was formerly more considerable, and the metropolis of the kingdom, but has been greatly reduced by frequent wars. Much teak timber is sent hence to Rangoon. It is seated on the Irrawaddy, 120 miles N.W. of Pegu. Lon. 95.0 W. Lat. 18. 50 N.

**PROMETHEUS**, in fabulous history, a son of Japetus, by Clymene, was brother to Atlas, and Epimetheus, and surpassed all mankind in cunning. He ridiculed the gods, and deceived Jupiter himself. To punish Prometheus and the rest of mankind, Jupiter took fire away from the earth, but the son of Japetus climbed the heavens by the assistance of Minerva, and stole fire from the chariot of the sun. This provoked Jupiter much; he ordered Vulcan to make a woman of clay, and after he had given her life, he sent her to Prometheus, with a box of the most valuable presents. (See **PANDORA**.) Prometheus, suspecting Jupiter, took no notice of Pandora, but made Epimetheus marry her, and the god, now more irritated, caused this artful mortal to be tied to a rock on mount Caucasus, where, for 30,000 years, a vulture was to feed upon his liver, which was never to be diminished. He was delivered from this punishment 30 years afterwards by Hercules. According to Apollodorus, Prometheus made the first man and woman that ever were upon the earth, with clay, which he animated by means of the fire which he had stolen from heaven. To him mankind are indebted for the invention of many of the useful arts.

**PROMETHIS**, and **PROMETHIDES**, a patronymic applied to the children of Prometheus as to Deucalion, &c.

**PROMINENCE.** **PRO'MINENCY.** *s.* (*prominentia*, Latin.) Protuberance; extant part (*Addison*).

**PROMINENT.** *a.* (*prominens*, Latin.) Standing out beyond the other parts; protuberant; extant (*Brown*).

**PROMISCUOUS.** *a.* (*promiscuus*, Latin.) Mingled; confused; undistinguished (*Tillotson*).

**PROMISCUOUSLY.** *ad.* With confused mixture; indiscriminately (*Sandys*).

**PROMISE.** *s.* (*promissum*, Latin.) 1. Declaration of some benefit to be conferred (*Dryden*). 2. Performance of promise; grant of the thing promised (*Acts*). 3. Hopes; expectation (*Shakspeare*).

**To PROMISE.** *v. a.* (*promitto*, Latin.) To make declaration of some benefit to be conferred (*Temple*).



To PRO'MISE. *v. n.* To assure one by a promise (*Dryden*).

PRO'MISEBREACH. *s.* (*breach* and *promise*.) Violation of promise: not in use (*Shakspeare*).

PRO'MISEBREAKER. *s.* (*promise* and *break*.) Violator of promises (*Shakspeare*).

PRO'MISER. *s.* (from *promise*.) One who promises (*Ben Jonson*).

PRO'MISSORILY. *ad.* (from *promissory*.) By way of promise (*Brown*).

PRO'MISSORY. *a.* (*promissorius*, Latin.) Containing profession of some benefit to be conferred (*Arbutnot*).

PRO'MONT. PRO'MONTORY. *s.* (*promontorium*, Latin.) A headland; a cape; high land jutting into the sea (*Suckling*, *Pope*).

To PROMOTE. *v. a.* (*promoveo*, *promotus*, Latin.) 1. To forward; to advance (*Milton*). 2. (*promouvoir*, Fr.) To elevate; to exalt; to prefer (*Milton*).

PROMO'TER. *s.* (*promoteur*, French.) 1. Advancer; forwarder; encourager (*Atterbury*). 2. Informer; makebate: obsolete (*Tusser*).

PROMO'TION. *s.* (*promotion*, Fr.) Advancement; encouragement; exaltation to some new honour or rank; preferment (*Milton*).

To PROMO'VE. *v. a.* (*promoveo*, Latin.) To forward; to advance; to promote (*Suckling*).

PROMPT. *a.* (*prompt*, Fr. *promptus*, Lat.) 1. Quick; ready; acute; easy (*Clarendon*). 2. Quick; petulant (*Dryden*). 3. Ready without hesitation; wanting no new motive (*Dryden*). 4. Ready; told down: as, *prompt* payment.

To PROMPT. *v. a.* (*prontare*, Italian.) 1. To assist by private instruction; to help at a loss (*Stillingfleet*). 2. To dictate (*Pope*). 3. To incite: to instigate (*Shakspeare*). 4. To remind (*Brown*).

PROMPTER. *s.* (from *prompt*.) 1. One who helps a public speaker, by suggesting the word to him when he falters (*Shakspeare*). 2. An admonisher; a reminder (*L'Estrange*).

PROMPTITUDE. *s.* (*promptitude*, Fr.) Readiness; quickness.

PROMPTLY. *ad.* (from *prompt*.) Readily; quickly; expeditiously (*Taylor*).

PROMPTNESS. *s.* (from *prompt*.) Readiness; quickness; alacrity (*South*).

PROMPTUARY. *s.* (*promptuarium*, Lat.) A storehouse; a repository; a magazine (*Woodward*).

PROMPTURE. *s.* (from *prompt*.) Suggestion; instigation: not used (*Shakspeare*).

To PROMU'LGATE. *v. a.* (*promulgo*, Latin.) To publish; to make known by open declaration (*Locke*).

PROMULGATION. *s.* (*promulgatio*, Latin.) Publication; open exhibition (*South*).

PROMULGATOR. *s.* (from *promulgate*.) Publisher; open teacher (*Decay of Piety*).

To PROMU'LGE. *v. a.* (from *promulgo*, Latin.) To promulgate; to publish; to teach openly (*Atterbury*).

PROMU'LGER. *s.* (from *promulge*.) Publisher; promulgator (*Atterbury*).

PRONATION. The act of turning the palm of the hand downwards. It is performed by rotating the radius upon the ulna, by means of several muscles which are termed pronators; as,

PRONATOR RADII QUADRATUS, in anatomy. This, which has gotten its name from its use and its shape, is a small fleshy muscle, situated at the lower and inner part of the fore arm, and covered by the tendons of the flexor muscles of the hand. It arises tendinous and fleshy from the lower and inner part of the ulna, and runs nearly in a transverse direction, to be inserted into that part of the radius which is opposite to its origin, its inner fibres adhering to the interosseous ligaments. This muscle assists in the pronation of the hand, by turning the radius inwards.

PRONATOR RADII TERES, in anatomy. This is a small muscle, situated at the upper and anterior part of the fore-arm. It is called *teres*, to distinguish it from the pronator quadratus. It arises tendinous and fleshy from the anterior and inferior part of the outer condyle of the os humeri; and tendinous from the coronoid process of the ulna, near the insertion of the brachialis internus. The median nerve passes between these two portions. From these origins the muscle runs obliquely downwards and outwards, and is inserted, tendinous and fleshy, into the anterior and convex edge of the radius, about the middle of that bone. This muscle, as its name indicates, serves to turn the hand inwards.

PRONE. *a.* (*pronus*, Latin.) 1. Bending downward; not erect (*Milton*). 2. Lying with the face downward; contrary to *supine* (*Brown*). 3. Precipitous; headlong; going downward (*Milton*). 4. Declivous; sloping (*Blackmore*). 5. Inclined; propense; disposed (*South*).

PRONENESS. *s.* (from *prone*.) 1. The state of bending downward; not erectness (*Brown*). 2. The state of lying with the face downward; not supineness. 3. Descent; declivity. 4. Inclination; propension; disposition to ill (*Hooker*).

PRONG. *s.* (*pronghen*, Dutch, to squeeze.) A fork (*Sandys*).

PRONITY. *s.* (from *prone*.) Proneness (*More*).

PRONOU'N. *s.* (*pronomen*, Lat.) A word that is used instead of the proper name. It is a declinable part of speech. See GRAMMAR.

To PRONOUN'CE. *v. a.* (*prononcer*, Fr. *pronuncio*, Latin.) 1. To speak; to utter (*Jeremiah*). 2. To utter solemnly; to utter confidently (*Shakspeare*). 3. To form or articulate by the organs of speech (*Holder*).

To PRONOU'NCE. *v. n.* To speak with confidence or authority (*South*).

PRONOUN'NCER. *s.* (from *pronounce*.) One who pronounces (*Ayliffe*).

PRONUNCIATION, in grammar, the manner of articulating or sounding the words of a language.

Among living languages the pronunciation of the French is the most difficult: and especially in that most of their words have two different pronunciations, the one in common prose, the other in verse.

As to the pronunciation of the English language, Mr. Martin, in his Spelling-book of Arts and Sciences, lays down the following rules: 1. The final (e) lengthens the sound of the foregoing vowel; as in *can, cane; rob, robe; tun, tune, &c.* 2. The final (e), in words ending in *re*, is sounded before the *r* like *u*; as, *massacre, massa-cur; lucre, lucur, &c.* 3. The Latin diphthongs, *æ, œ*, are sounded like *e*; as *Ætna, Etna; æconomy, economy, &c.* but at the end of the words *œ* sounds like *o*; as in *toe, foe, &c.* 4. Also the English improper diphthongs, *ea, eo, eu, ue*, only sound the *e* and *u*; as *tea or te; feeffee, or fessée; due or du; true or tru, &c.* though sometimes *eo* and *ea* are pronounced like *ee*, as in *people, fear, near, &c.* 5. Sometimes the diphthong (*ie*) is pronounced like *e* in *cieling*, like *ee* in *field*, and at the end of words always like *y*, as in *lie, &c.* and *ei* is pronounced either like *e* or *ai*, as in *deceit, reign, &c.* 6. The triphthong *eau* is pronounced like *o*, in *beau and jet d'eau*; and *ieu* sounds like *u* in *lieu, adieu, &c.* 7. The sound of *c* is hard before the vowels *a, o, u*, as in *call, cold, cup, &c.* also sometimes before *h*, as in *chart, chord, &c.* and before *l* and *r*, as in *clear, creep, &c.* It is otherwise generally soft, as in *city, cell, cyder, child, &c.* 8. In French words *ch* is sounded like *sh*, as in *chagreen, machine*; and sometimes like *qu*, as in *choir.* 9. The sound of *g* is hard before *a, o, u, l, r*, as in *gall, go, gum, glean, grope*; also before *ui*, as in *guilt, guild, &c.* and before *h*, as *ghost*; sometimes before *i*, as in *gibbous, gibberish.* It is also generally hard before *e*, as in *get, geld, &c.* but soft in many words derived from the Greek and Latin, as in *geometry, genealogy, genus, &c.* Two *gg* are always hard, as in *dagger, &c.* The sound of *g*, when soft, is like that of *j.* 10. In any part of a word, *ph* sounds like *f*, as in *philosophy, &c.* 11. The sound of *qu*, at the end of French words, is like *k*, as in *risque, &c.* 12. The syllables *ti* and *ci*, if followed by a vowel, sound like *si* or *shi*; as in *fiction, logician, &c.* 13. When *cc* occurs before *i*, the first is hard and the latter soft: as in *flaccid, &c.* 14. The letter *p* is not pronounced at the beginning of syllables before *s* and *t*; as in *psalm, ptarmics, &c.* As to other peculiarities regarding the pronunciation of single letters, many of them have been taken notice of at the beginning of each, in the course of this work.

But it is not enough to know the just pronunciation of single letters, but also of words: in order to which the accenting of words ought to be well understood; since nothing is more harsh and disagreeable to the ear, than to hear a person speak or read with wrong accents. And indeed in English the same word is often both a noun and a verb, distinguished only by the accent, which is on the first syllable of the noun, and on the last of the verb; as, *ferment*

and *ferment*; *ricord* and *record*, &c. We are to observe also, that in order to a just expression of words, some require only a single accent on the syllable, as in *tórmént, &c.*; but in others it should be marked double, as in *a'nímal*, because it is pronounced as if the letter were written double, viz. *animal*.

The pronunciation of words in a living language must, doubtless, be subject to slight and almost imperceptible modifications from custom and habit: but it behoves all men of literature to resist, as far as may be, the invasion of *fashion* into the province of language. Otherwise oral language, being exposed to the changes suggested by the caprice, or fancy, or vanity of those who suppose themselves capable of introducing new modes, without possessing one qualification that fits them for the undertaking, will, instead of presenting an orderly harmonious whole, be reduced to a ridiculous chaotic mass.

We believe that popular actors on the stage have been tempted to take greater liberties in this respect than any other class of men; and on this point we believe Mr. Kemble has a just load of censure lying at his door. The vagaries rendered current by this gentleman and his imitators are such, as if the great formers of the standard of the English language, Addison, Swift, Pope, Lowth, &c. were now living, would cause them to be sneered at by half the boarding-school young ladies in the kingdom, for their boorish, uncouth manner of pronouncing words. We will venture to produce, miscellaneous, a few specimens of the liberties taken with the language by the sort of persons to whom we now refer; and leave it to the good sense of our young readers to avoid the whole class of improprieties which this short list will suggest to them.

|            |            |                     |
|------------|------------|---------------------|
| Perfume,   | pronounced | <i>perf-yume.</i>   |
| Premature, |            | <i>prema-chure.</i> |
| Gratitude, |            | <i>grati-chude.</i> |
| Solitude,  |            | <i>solí-chude.</i>  |
| Tuesday,   |            | <i>Tchuse-day.</i>  |
| Tulip,     |            | <i>tchu-lip.</i>    |
| Hughes,    |            | <i>Yews.</i>        |

Half, glass, &c. with the *a* sounded like a *im hat* instead of like *a* in *call*.—Acceptable, with the accent on the first syllable, instead of the second.

PROOF. *s.* (from *prove*.) 1. Evidence; testimony; convincing token; means of conviction (*Locke*). 2. Test; trial; experiment (*Milton*). 3. Firm temper; impenetrability (*Dryden*). 4. Armour hardened till it will abide a certain trial (*Shakspeare*). 5. In printing, the rough draught of a sheet when first pulled.

PROOF, the shewing or making plain the truth of any matter alleged; either in giving evidence to a jury on a trial, or else on interrogatories or by copies of records, or exemplifications of them. See EVIDENCE.

PROOF of artillery and small arms, is a trial whether they stand the quantity of powder allotted for that purpose. The rule of the board of ordnance is, that all guns under 24-



pounders are loaded with powder as much as their shot weighs; that is, a brass 24-pounder with 21 lb. a brass 32-pounder with 26 lb. 12 oz. and a 42-pounder with 31 lb. 8 oz. the iron 24-pounder with 18 lb. the 32-pounder with 21 lb. 8 oz. and the 42-pounder with 25 lb.

The brass light field-pieces are proved with powder that weighs half as much as their shot, except the 24-pounder, which is loaded with 10 lb. only.

Government allows 11 bullets of lead in the pound for the proof of muskets; and 14.5, or twenty-nine in two for service; seventeen in the pound for the proof of carbines, and twenty for service; twenty-eight in the pound for the proof of pistols, and thirty-four for service.

When guns of a new metal, or of lighter construction, are proved; then, besides the common proof, they are fired 200 or 300 times, as quick as they can be loaded with the common charge given in actual service. Our light six-pounders were fired 300 times in three hours and twenty-seven minutes, loaded with 1 lb. 4 oz. without receiving any damage.

**PROOF of powder**, is in order to try its goodness and strength. See **GUNPOWDER**.

**PROOF of cannon**, is made to ascertain their being well cast, their having no cavities in the metal, and in a word, their being fit to resist the effort of their charge of powder. When guns are rejected by the proof-masters, they order them to be marked  $\times$  thus, which the contractors generally alter *WP* thus; and after such alteration dispose of them to foreign powers for Woolwich proof.

The most curious instrument for finding the principal defects in pieces of artillery was invented by lieutenant-general Desaguliers, of the royal artillery. This ingenious instrument, which is nearly upon the principle of some of our pyrometers, is no sooner introduced into any part of the interior of a gun than it magnifies and points out its defects, and more particularly that of the piece not being truly bored; which is a very important one, and to which most of the disasters happening to pieces of artillery are in a great measure to be imputed; for, when a gun is not truly bored, the most expert artillerist will not be able to make a good shot.

**PROOF of mortars and howitzers**, is made to ascertain their being well cast, and of strength to resist the effort of their charge. For this purpose the mortar or howitzer is placed upon the ground, with some part of their trunnions or breech sunk below the surface, and resting on wooden billets, at an elevation of about 70 degrees. The mirror is generally the only instrument to discover the defects in mortars and howitzers. In order to use it the sun must shine; the breech must be placed towards the sun, and the glass over against the mouth of the piece: it illuminates the bore and chamber sufficiently to discover the flaws in it.

**PROOF of foreign brass artillery**.—1. The Prussians. Their battering-train and garrison

artillery are proved with a quantity of powder equal to half the weight of the shot, and fired 75 rounds as fast as in real service; that is, 2 or 3 rounds in a minute. Their light field-train, from a twelve-pounder upwards, are proved with a quantity of powder = 1-3d of the weight of the shot, and fired 150 rounds, at three or four rounds in a minute. From a twelve-pounder downwards, are proved with a quantity of powder = 1-5th of the shot's weight and fired 300 rounds, at five or six rounds each minute, properly spunged and loaded. Their mortars are proved with the chambers full of powder, and the shells loaded. Three rounds are fired as quick as possible. 2. The Dutch prove all their artillery by firing each piece five times: the two first rounds with a quantity of powder = 2-3ds of the weight of the shot; and the three last rounds with a quantity of powder = half the weight of the shot. 3. The French the same as the Dutch.

**PROOF**, in brandy and other spirituous liquors, is a little white lather which appears on the top of the liquor when poured into a glass. This lather, as it diminishes, forms itself into a circle called by the French the *chapelet*, and by the English the bead or bubble.

**PROOFS of prints**, were anciently a few impressions taken off in the course of an engraver's process. He proved a plate in different states, that he might ascertain how far his labours had been successful, and when they were complete. The excellence of such early impressions, worked with care, and under the artist's eye, occasioning them to be greedily sought after, and liberally paid for, it has been customary among our modern printers to take off a number of them, amounting, perhaps to hundreds, from every plate of considerable value; and yet their want of rareness has by no means abated their price. On retouching a plate, it has been also usual, among the same conscientious fraternity, to cover the inscription, which was immediately added after the first proofs were obtained, with slips of paper, that a number of secondary proofs might also be created.

**PROOF. a.** Impenetrable; able to resist (*Collier*).

**PROOFLESS. a.** (from *proof*.) Unproved; wanting evidence (*Boyle*).

**To PROP. v. a.** (*proppe*, Dutch.) 1. To support by placing something under or against (*Milton*). 2. To support by standing under or against (*Creech*). 3. To sustain; to support (*Pope*).

**PROP. s.** (*proppe*, Dutch.) A support; a stay; that on which any thing rests. See **FULCRUM**.

**PROPAGABLE. a.** (from *propagate*.) Such as may be spread (*Boyle*).

**To PROPAGATE. v. a.** (*propago*, Lat.) 1. To continue or spread by generation or successive production (*Otway*). 2. To extend; to widen (*Shakspeare*). 3. To carry on from place to place; to promote (*Newton*). 4. To increase; to promote (*Shakspeare*). 5. To generate (*Clarissa*).

To PRO'PAGATE. *v. n.* To have offspring (*Milton*).

PROPAGATION. *s.* (*propagatio*, Latin.) Continuance or diffusion by generation or successive production (*Wiseman*).

PROPAGATOR. *s.* (from *propagate*.) 1. One who continues by successive production. 2. A spreader; a promoter (*Addison*).

PROPAGO. *Sēmen musci decorticationem, detectum 1750.* A peculiar name given by Linnæus to the seeds of mosses; because he supposed them to differ from other seeds in having a naked corcle or heart, without cotyledons: a discovery which he made in 1750.

To PROPEL. *v. a.* (*propello*, Latin.) To drive forward (*Harvey*).

To PROPEND. *v. n.* (*propendo*, Lat. to hang forward.) To incline to any part; to be disposed in favour of any thing (*Shakspeare*).

PROPENSITY. *s.* (from *propend*.) 1. Inclination or tendency of desire to any thing. 2. (from *propendo*, Latin, to weigh.) Preconsideration; attentive deliberation; perpendency (*Hale*).

PROPENSE. *a.* (*propensus*, Lat.) Inclined; disposed (*Milton*).

PROPENSION. PROPENSITY. *s.* (*propensio*, Fr. *propensio*, Lat.) 1. Moral inclination; disposition to any thing good or bad (*Rogers*). 2. Natural tendency (*Digby*).

PROPER. *a.* (*proprius*, Latin.) 1. Peculiar; not belonging to more; not common (*Davies*). 2. Noting an individual (*Watts*). 3. One's own (*Shakspeare*). 4. Natural; original (*Milton*). 5. Fit; accommodated; adapted; suitable; qualified (*Dryden*). 6. Exact; accurate; just. 7. Not figurative (*Burnet*). 8. It seems in *Shakspeare* to signify, mere; pure. 9. (*propre*, Fr.) Elegant; pretty (*Heb.*). 10. Tall; lusty; handsome with bulk (*Shakspeare*).

PROPER RECEPTACLE, in botany. *Quod partes unius tantum fructificationis respicit.* That which respects the parts of a single fructification: in opposition to a common receptacle, connecting several florets, as in the aggregate flowers.—Proper perianth.—Involucre. A proper perianth, or involucre, respecting one flower only. As in simple flowers. Aggregate flowers have usually both a calyx common to the whole, and a perianth proper to each floret. Proper flower or corol. One of the single florets or corollets in aggregate flowers: in opposition to the common or compound flower, consisting of the aggregate of florets, making one whole. Proper nectary. Separate from the petals and other parts of the flower.

PROPERLY. *ad.* (from *proper*.) 1. Fitly; suitably. 2. In a strict sense (*Milton*).

PROPERNESS. *s.* (from *proper*.) 1. The quality of being proper; 2. Talness.

PROPERTIUS (*Sextus Aurelius*), a Latin poet, born in Umbria. His father was a Roman knight, proscribed by Augustus. He came to Rome, where his genius soon recommended him to the notice of the great. *Mecænas*, *Gallus*, and *Virgil* became his friends,

and Augustus his patron. *Mecænas* wished him to attempt an epic poem, of which he proposed the emperor for hero, but *Propertius* refused to undertake the task. He died about 19 years before Christ, in the 40th year of his age. His works consist of four books of elegies, written with so much vivacity and energy, that many authors call him the prince of the elegiac poets among the Latins. *Cynthia*, the heroine of his elegies, was a Roman lady, whose real name was *Hostia* or *Hostilia*. *Propertius* has usually a place assigned him in the editions of *Tibullus* and *Catullus*: but the best edition of *Propertius* is that which was given separately by *Janus Brouckhusius* at Amsterdam, 1702, in 4to, and again in 1714, 4to, *cum curis secundis ejusdem*. There is a respectable edition in 4to, by *Lantanius*, date 1780.

PROPERTY. *s.* (from *proper*.) 1. Peculiar quality (*Hooker*). 2. Quality; disposition (*South*). 3. Right of possession (*Locke*). 4. Possession held in one's own right (*Dryden*). 5. The thing possessed (*Swift*). 6. Nearness or right (*Shakspeare*). 7. Something useful; an appendage (*Dryden*).

To PRO'PERTY. *v. a.* Not now used. 1. To invest with qualities (*Shakspeare*). 2. To seize or retain as something owned; to appropriate; to hold (*Shakspeare*).

PROPHASIS. *s.* (*προφησῖς*.) In medicine, a foreknowledge of diseases.

PROPHECY, is a word derived from *προφητεία*, and in its original import signifies the prediction of future events.

As God alone can perceive with certainty the future actions of free agents, and the remote consequences of those laws of nature which he himself established, prophecy, when clearly fulfilled, affords the most convincing evidence of an intimate and supernatural communion between God and the person who uttered the prediction. Together with the power of working miracles, it is indeed the only evidence which can be given of such a communion. Hence, among the professors of every religious system, except that which is called the religion of nature, there have been numberless pretenders to the gift of prophecy. The Pagan nations of antiquity had their oracles, augurs, and soothsayers. Modern idolators have their necromancers and diviners; and the Jews, Christians and Mahometans have their seers and prophets.

The ill-founded pretensions of paganism, ancient and modern, have been exposed under various articles of this work. (See *DIVINATION*, *MAGIC*, *NECROMANCY*, and *MYTHOLOGY*.) And the claims of the Arabian impostor are examined under the articles *ALCORAN* and *MAHOMETANISM*; so that at present we have only to consider the use, intent, and truth of the Jewish and Christian prophecies.

Previous to our entering on this investigation, it may be proper to observe, that, in the scriptures of the Old and New Testaments, the signification of the word prophecy is not always confined to the foretelling of future events. In



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several instances it is of the same import with preaching, and denotes the faculty of illustrating, and applying to present practical purposes, the doctrines of prior revelation. Thus, in Nehemiah it is said, "Thou hast appointed prophets to preach;" and whoever speaketh unto men to edification, and exhortation, and comfort, is by St. Paul called a prophet. Hence it was that there were schools of prophets in Israel, where young men were instructed in the truths of religion, and fitted to exhort and comfort the people.

In this article, however, it is chiefly of importance to confine ourselves to that kind of prophecy which, in declaring truths either past, present, or future, required the immediate inspiration of God.

Every one who looks into the history of the world must observe, that the minds of men have from the beginning been gradually opened by a train of events still improving upon, and adding light to each other; as that of each individual is, by proceeding from the first elements and seeds of science, to more enlarged views and a still higher growth. Mankind neither are nor ever have been capable of entering into the depths of knowledge at once; of receiving a whole system of natural or moral truths together; but must be let into them by degrees, and have them communicated by little and little, as they are able to bear it. That this is the case with respect to human science is a fact which cannot be questioned; and there is a little room to question it with respect to the progress of religious knowledge among men, either taken collectively or in each individual. Why the case is thus in both, why all are not adult at once in body and mind, is a question which the religion of nature is equally called upon with revelation to answer. The fact may not be easily accounted for, but the reality of it is incontrovertible.

Accordingly, the great object of the several revelations recorded in the Old Testament was evidently to keep alive a sense of religion in the minds of men, and to train them by degrees for the reception of those simple but sublime truths by which they were to be saved. The notions which the early descendants of Adam entertained of the Supreme Being, and of the relation in which they stood to him, were probably very gross; and we see them gradually refined by a series of revelations or prophecies, each in succession more explicit than that by which it was preceded, till the advent of Him who was the way, the truth, and the life, and who brought to light life and immortality.

In order to form a right judgment of the argument for the truth of Christianity drawn from the sure word of prophecy, we must not consider the prophecies given in the Old Testament as so many predictions only independent of each other; for, if we do, we shall totally lose sight of the purpose for which they were originally given, and shall never be able to satisfy ourselves when confronted by the objections of unbelievers. It is easy for men of leisure and tolerable parts to find difficulties in

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particular predictions, and in the application of them made by writers who lived many hundred years ago, and who had many ancient books and records of the Jewish church, from which they drew many passages, and perhaps some prophecies; which books and records we have not, to enable us to understand and to justify their applications. But it is not so easy a matter to show, or to persuade the world to believe, that a chain of prophecies reaching through several thousand years, delivered at different times, yet manifestly subservient to one and the same administration of providence from beginning to end, is the effect of art and contrivance and religious fraud. In examining the several prophecies recorded in the Old Testament, we are not to suppose that each of them expressly pointed out and clearly characterised Jesus Christ. Had they done so, instead of being a support to religion in general, the purpose for which they were originally intended, they would have had a very different effect, by making those to whom they were given repine at being placed under dispensations so very inferior to that of the gospel. We are therefore to inquire only whether all the notices, which, in general and often metaphorical terms, God gave to the fathers, of his intended salvation, are perfectly answered by the coming of Christ; and we shall find, that nothing has been promised with respect to that subject which has not been performed in the amplest manner. If we examine the prophecies in this manner, we shall find that there is not one of them, which the Apostles have applied to the Messiah, that is not applicable in a rational and important sense to something in the birth, life, preaching, death, resurrection, and ascension of Jesus of Nazareth; that, as applied to him, they are all consistent with each other; and that, though some few of them may be applied without absurdity to persons and events under the Jewish dispensation, Christ is the only person that ever existed in whom they all meet as in a centre. In the limits prescribed us, it is impossible that we should enter upon a particular proof of this position. It has been proved by numberless writers, and, with respect to the most important prophecies, by none with greater success than bishop Sherlock in his *Use and Intent of Prophecy in the several Ages of the World*; a work which we recommend to our readers, as one of the most valuable on the subject in our own or any other language.

But, admitting that it would have been improper, for the reasons already hinted at, to have given a clear and precise description of Christ, and the Christian dispensation, to men who were ordained to live under dispensations less perfect—how, it may be asked, comes it to pass, that many of the prophecies applied by the writers of the gospel to our Saviour and his actions are still dark and obscure, and so far from belonging evidently to him and to him only, that it requires much learning and sagacity to show even now the connection between some prophecies and the events?

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In answer to these questions, the learned prelate just referred to observes, "That the obscurity of prophecy does not arise from hence, that it is a relation or description of something future; for it is as easy to speak of things future plainly, and intelligibly, as it is of things past or present. It is not, therefore, of the nature of prophecy to be obscure; for it may easily be made, when he who gives it thinks fit, as plain as history." On the other side, a figurative and dark description of a future event will be figurative and dark still when the event happens; and consequently will have all the obscurity of a figurative and dark description as well after as before the event. The prophet Isaiah describes the peace of Christ's kingdom in the following manner: "The wolf shall dwell with the lamb, and the leopard shall lie down with the kid, and the calf and the young lion, and the faling; together, and a little child shall lead them." Nobody, some modern Jews excepted, ever understood this literally; nor can it now be literally applied to the state of the gospel. It was and is capable of different interpretations: it may mean temporal peace, or that internal and spiritual peace—that tranquillity of mind, which sets a man at peace with God, himself, and the world. But, whatever the true meaning is, this prophecy does no more obtrude one determinate sense upon the mind since the coming of Christ than it did before. But then we say, the state of the gospel was very properly prefigured in this description, and is as properly prefigured in a hundred more of the like kind; and since they all agree in a fair application to the state of the gospel, we strongly conclude, that this state was the thing foretold under such expressions. So that the argument from prophecy for the truth of Christianity does not rest on this, that the event has necessarily limited and ascertained the particular sense and meaning of every prophecy; but in this, that every prophecy has in a proper sense been completed by the coming of Christ. It is absurd, therefore, to expect clear and evident conviction from every single prophecy applied to Christ: the evidence must arise from a view and comparison of all together." It is doubtless a great mistake to suppose that prophecy was intended solely or chiefly for their sakes in whose time the events predicted are to happen. What great occasion is there to lay in so long beforehand the evidence of prophecy to convince men of things that are to happen in their own times; the truth of which they may, if they please, learn from their own senses? Yet some people are apt to talk, as if they thought the truth of the events predicted depended very much on the evidence of prophecy: they speak, for instance, as if they imagined the certainty and reality of our Saviour's resurrection were much concerned in the clearness of the prophecies relating to that great and wonderful event, and seem to think that they are confuting the truth of his resurrection when they are pointing out the absurdity of the prophecies relating to it. But can any thing be more absurd? For, what

ground or pretence is there to inquire, whether the prophecies foretelling that the Messiah should die, and rise again, do truly belong to Christ, unless we are first satisfied that Christ died, and rose again?

The part which unbelievers ought to take in this question, if they would make any use of prophecy, should be, to show from the prophets that Christ was necessarily to rise from the dead; and then to prove that in fact Jesus never did rise. Here would be a plain consequence. But, if they like not this method, they ought to let the prophecies alone; for, if Christ did not rise, there is no harm done though the prophets have not foretold it. And if they allow the resurrection of Christ, what do they gain by discrediting the prophets? The event will be what it is, let the prophecies be what they will.

These considerations show how far the gospel is necessarily concerned in prophetic evidence, and how clear the prophecies should be. Christ claims to be the person foretold in the law and the prophets; and, as truth must ever be consistent with itself, this claim must be true as well as all others. This is the part then to be tried on the evidence of prophecy: Is Christ that person described and foretold under the Old Testament, or not? Whether all the prophecies relating to him be plain or not plain, it matters little; the single question is, Are there enough plain, to show us that Christ is the person foretold under the Old Testament? If there be, we are at an end of our inquiry, and want no further help from prophecy; especially since we have seen the day dawn, and enjoyed the marvellous light of the gospel of God.

But so unreasonable are unbelievers, that, whilst some of them object to the obscurity of the prophecies, others have rejected them altogether on account of their clearness, pretending that they are histories, and not predictions. The prophecies against which this objection has been chiefly urged are those of Daniel, which were first called in question by the famous Porphyry. He affirmed that they were not composed by Daniel, whose name they bear, but by some author who lived in Judea about the time of Antiochus Epiphanes; because all to that time contained true history, but that all the facts beyond that were manifestly false.

This method of opposing the prophecies, as a father of the church rightly observes, is the strongest testimony of their truth; for they are so exactly fulfilled, that to infidels the prophet seemed not to have foretold things future, but to have related things past. To an infidel of this age, if he has the same ability and knowledge of history that Porphyry had, all the subsequent prophecies of Daniel, except those which are still fulfilling, would appear to be history, and not prophecy: for it entirely overthrows the notion of their being written in the days of Antiochus Epiphanes, or of the Maccabees, and establishes the credit of Daniel as a prophet beyond contradiction, that there



are several of those prophecies which have been fulfilled since that period as well as before; nay, that there are prophecies of Daniel which are fulfilling at this very time in the world.

We might here subjoin many prophecies both from the Old and the New Testament, and especially from the writings of St. Paul and St. John, which so clearly describe the various fortunes of the Christian church, her progress to that state of general corruption under which she was sunk three centuries ago, and her gradual restoration to her primitive purity, that they cannot be supposed to proceed from the cunning craftiness of men, or to have been written after the events of which they speak. To do justice to these, however, would require a volume, and many excellent volumes have been written upon them. The reader who wishes for satisfaction on so interesting a subject will do well to consult the writings of Mr. Mede and sir Isaac Newton, together with bishop Newton's Dissertations, and the Sermons of Hurd, Halifax, and Bagot, preached at Warburton's lecture. We shall only observe, that one of the ablest reasoners that Great Britain ever produced, (Dr. Clarke) after having paid the closest attention to the predictions of the New Testament, has been bold enough to put the truth of revealed religion itself upon the reality of that prophetic spirit which foretold the desolation of Christ's church and kingdom by antichrist. "If," says he, "in the days of St. Paul and St. John, there was any footstep of such a sort of power as this in the world; or if there had been any such power in the world; or if there was then any appearance or probability that could make it enter into the heart of man to imagine that there ever could be any such kind of power in the world, much less in the temple or church of God; and if there be not now such a power actually and conspicuously exercised in the world; and if any picture of this power, drawn after the event, can now describe it more plainly and exactly than it was originally described in the words of the prophecy—then may it with some degree of plausibility be suggested, that the prophecies are nothing more than enthusiastic imaginations."

Upon the whole, we conclude with bishop Sherlock, that the various prophecies recorded in the Holy Scriptures were given, not to enable man to foresee with clearness future events, but to support the several dispensations of religion under which they were respectively promulgated. The principal prophecies recorded in the Old Testament led mankind to hope for a complete deliverance from the curse of the fall; and therefore tended to fill their minds with gratitude, and to enforce a cheerful obedience to that God who in the midst of judgement remembereth mercy. The prophecies, whether in the Old or New Testament, that portray the present state of the Jews, and the various fortunes of the Christian church, as they are daily fulfilling in the presence of all men, are the strongest possible proof of the divinity

of our holy religion, and supply to us in the latter days the place of miracles, by which it was at first established.

In addition to the preceding references, we beg to point to Lowth on Isaiah, Horsley on Hosea, Abbadie on the Prophecies, Smith's Summary View of the Writings of the Prophets (a very comprehensive and useful work in small compass), Dr. Collyer's Lectures on Prophecy, and the Essay on the same subject in Dr. Gregory's Letters on the Evidences, Doctrines, and Duties of the Christian Religion.

PROPHESIER. *s.* (from *prophecy*.) One who prophesies.

To PROPHESY. *v. a.* 1. To predict, to foretell (*Shakspeare*). 2. To foreshow (*Sh.*).

To PROPHESY. *v. n.* 1. To utter predictions (*Shakspeare*). 2. To preach. A scriptural sense (*Ezekiel*).

PROPHET. *s.* (*prophete*, Fr. *προφητης*.) 1. One who tells future events; a predictor; a foreteller (*Dryden*). 2. One of the sacred writers empowered by God to display futurity (*Shakspeare*).

PROPHET. (*propheta*, *προφητης*.) A person inspired by God with the knowledge of future events; and commissioned to declare his laws, his will, &c. to the world.

The word is derived from the Greek *προ*, and *φημι*, said; of *φημι*, I say; whence also the Latins derive their *fatus*, spoken.

Among the canonical books are those of sixteen prophets; four of which are denominated the greater prophets, viz. Isaiah, Jeremiah, Ezekiel, and Daniel; so called from the length or extent of their writings, which exceed those of the others: viz. Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habbakuk, Haggai, Zechariah, and Malachi; who are called the lesser prophets, from the shortness of their writings.

The writings of the prophets form one of the three divisions of the canon of the Old Testament; and to those already enumerated, called the books of the latter prophets, are added those of the former prophets; viz. Joshua, Judges, Samuel, and Kings.

The Jews only reckon three greater prophets: Daniel they exclude, as no more to be ranked among the prophets than David; not but that both the one and the other foretold many important things, but because their manner of life differed from that of the other prophets; David being a king, and Daniel a peer.

In the Greek church, the lesser prophets are placed in order before the great ones; apparently, because many of the lesser prophets are more ancient than the greater.

Among the Greeks, too, Daniel is ranked among the lesser prophets. In the forty-eighth chapter of Ecclesiasticus, Isaiah is particularly called the great prophet; both on account of the great things he foretold, and the magnificent manner wherein he did it.

Spinoza says, the several prophets prophesied according to their respective humours: Jeremiah, e. gr. melancholy, and dejected

with the miseries of life, prophesied nothing but misfortunes.

Dacier observes, that, among the ancients, the name poet is sometimes given to prophets; as that of prophet is, at other times, given to poets.

**PROPHETESS.** *s.* (*prophetesse*, French.) A woman that foretells future events (*Peach.*).

**PROPHETICAL.** **PROPHETIC.** *a.* (*prophetique*, Fr.) Foreseeing or foretelling future events (*Stillingfleet*).

**PROPHETICALLY.** *ad.* (from *prophetical*.) With knowledge of futurity; in manner of a prophecy (*Hammond*).

**To PROPHETIZE.** *v. n.* (*prophetiser*, Fr.) To give predictions: not in use (*Daniel*).

**PROPHYLACTIC.** *a.* (*προφυλακτικός*.) Preventive; preservative (*Watts*).

**PROPHYLACTICS.** (*προφυλακτικα*, from *προ*, before, and *φυλασσω*, to defend.) Any means made use of to preserve health.

**PROPINQUITY.** *s.* (*propinquitas*, Latin.)

1. Nearness; proximity; neighbourhood (*Ray*).  
2. Nearness of time (*Brown*). 3. Kindred; nearness of blood (*Shakspeare*).

**PROPTIABLE.** *a.* (from *propitiate*.) Such as may be induced to favour; such as may be made propitious.

**To PROPTIATE.** *v. a.* (*propitio*, Latin.) To induce to favour; to gain; to conciliate; to make propitious (*Stillingfleet*).

**PROPTIATION.** *s.* (*propitiation*, Fr.)

1. The act of making propitious. 2. The atonement; the offering by which propitiousness is obtained (*Johnson*).

**PROPTIATOR.** *s.* (from *propitiate*.) One that propitiates.

**PROPTIATORY.** *a.* (*propitiatoire*, Fr.) Having the power to make propitious (*Still*).

**PROPTIOUS.** *a.* (*propitius*, Lat. *propice*, Fr.) Favourable; kind (*Addison*).

**PROPTIOUSLY.** *ad.* (from *propitius*.) Favourably; kindly (*Roscommon*).

**PROPTIOUSNESS.** *s.* (from *propitius*.) Favourableness; kindness (*Temple*).

**PROPLASM.** *s.* (*πρόπλασμα* and *πλασμα*.) Mould; matrix (*Woodward*).

**PROPLASTICE.** *s.* (*προπλαστική*.) The art of making moulds for casting.

**PROPONENT.** *s.* (from *proponens*, Lat.) One that makes a proposal, or lays down a position (*Dryden*).

**PROPONTIS**, a sea which has a communication with the Euxine, by the Thracian Bosphorus, and with the Ægean by the Hellespont, now called the sea of Marmora.

**PROPORTION.** *s.* (*proportion*, French; *proportio*, Latin.) 1. Comparative relation of one thing to another; ratio (*Raleigh*). 2. Settled relation of comparative quantity; equal degree (*Addison*). 3. Harmonic degree (*Milton*). 4. Symmetry; adaptation of one to another (*Addison*). 5. Form; size (*Davies*).

**To PROPORTION.** *v. a.* (*proportionner*, Fr.) 1. To adjust by comparative relation (*Addison*). 2. To form symmetrically (*Sidney*).

**PROPORTION**, in mathematics, the equality or similitude of ratios. As the four numbers

4, 8, 15, 30 are proportionals, or in proportion, because the ratio of 4 to 8 is equal or similar to the ratio of 15 to 30, both of them being the same as the ratio of 1 to 2.

Euclid, in the 5th definition of the 5th book, gives a general definition of four proportionals, or when, of four terms, the first has the same ratio to the 2d, as the 3d has to the 4th, viz. when any equimultiples whatever of the first and third being taken, and any equimultiples whatever of the 2d and 4th; if the multiple of the first be less than that of the 2d, the multiple of the 3d is also less than that of the 4th; or if the multiple of the first be equal to that of the 2d, the multiple of the 3d is also equal to that of the 4th; or if the multiple of the first be greater than that of the 2d, the multiple of the 3d is also greater than that of the 4th. And this definition is general for all kinds of magnitudes or quantities whatever, though it is a very obscure one.

Also, in the 7th book, Euclid gives another definition of proportionals, viz. when the first is the same equimultiple of the 2d, as the 3d is of the 4th, or the same part or parts of it. But this definition appertains only to numbers and commensurable quantities.

Proportion is often confounded with ratio; but they are quite different things. For, ratio is properly the relation of two magnitudes or quantities of one and the same kind; as the ratio of 4 to 8, or of 15 to 30, or of 1 to 2; and so implies or respects only two terms or things. But proportion respects four terms or things, or two ratios which have each two terms. Though the middle term may be common to both ratios, and then the proportion is expressed by three terms only, as 4, 8, 64, where 4 is to 8 as 8 to 64.

Proportion is also sometimes confounded with progression. In fact, the two often coincide; the difference between them only consisting in this, that progression is a particular species of proportion, being indeed a continued proportion, or such as has all the terms in the same ratio, viz. the 1st to the 2d, the 2d to the 3d, the 3d to the 4th, &c.; as the terms 2, 4, 8, 16, &c.; so that progression is a series or continuation of proportions.

Once more, as Dr. Clarke very justly remarked in his controversy with Leibnitz, proportions are not quantities but the proportions of quantities, and the same may be said of ratios. If they were quantities, they would be the quantities of quantities; which is absurd. Besides, if they were quantities, they would, like all other quantities, increase always by addition. But the addition of the ratio of 1 to 1, to that of 1 to 1, makes still no more than that of 1 to 1; and the addition of the ratio of a half to one, to that of 1 to 1, does not make the proportion of 1 and a half to 1, but that only of a half to 1. That which mathematicians sometimes inaccurately call the quantity of proportion, is (accurately and strictly speaking) only the quantity of the relative or comparative magnitude of one thing with regard to another; and



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proportion is not the comparative magnitude itself, but the comparison or relation of the magnitude to another. The relation of 6 to 1, with regard to that of 3 to 1, is not a double quantity of proportion, but the proportion of a double quantity. And, in general, what they call bearing a greater or less proportion, is not bearing a greater or less quantity of proportion or relation, but bearing the proportion or relation of a greater or less quantity, to another: it is not a greater or less quantity of comparison, but the comparison of a greater or less quantity. The reader will see, that all this is perfectly consistent with our definition of mathematics.

Proportion is either continual, or discrete or interrupted.

The proportion is continual when every two adjacent terms have the same ratio, or when the consequent of each ratio is the antecedent of the next following ratio, and so all the terms form a progression; as 2, 4, 8, 16, &c.; where 2 is to 4 as 4 to 8, and as 8 to 16, &c.

Discrete or interrupted proportion, is when the consequent of the first ratio is different from the antecedent of the 2d, &c.; as 2, 4, and 3, 6.

Proportion is also either direct or inverse.

*Direct proportion* is when more requires more, or less requires less. As it will require more men to perform more work, or fewer men for less work, in the same time.

*Inverse or reciprocal proportion*, is when more requires less, or less requires more. As it will require more men to perform the same work in less time, or fewer men in more time. Ex. If 6 men can perform a piece of work in 15 days, how many men can do the same in 10 days. Then,  
 Reciprocally - as  $\frac{1}{15}$  to  $\frac{1}{10}$  so is 6 : 9 the an-  
 or inversely - as 10 to 15 so is 6 : 9 swer.

Proportion again, is distinguished into arithmetical, geometrical, and harmonical.

*Arithmetical proportion* is the equality of two arithmetical ratios, or differences. As in the numbers 12, 9, 6; where the difference between 12 and 9, is the same as the difference between 9 and 6, viz. 3.

And here the sum of the extreme terms is equal to the sum of the means, or to double the single mean when there is but one. As  $12 + 6 = 9 + 9 = 18$ .

*Geometrical proportion* is the equality between two geometrical ratios, or between the quotients of the terms. As in the three 9, 6, 4, where 9 is to 6 as 6 is to 4, thus denoted  $9 : 6 :: 6 : 4$ ; for  $\frac{9}{6} = \frac{6}{4}$ , being each equal  $\frac{3}{2}$  or  $1\frac{1}{2}$ .

And in this proportion, the rectangle or product of the extreme terms, is equal to that of the two means, or the square of the single mean when there is but one. For  $9 \times 4 = 6 \times 6 = 36$ .

*Harmonical proportion*, is when the first term is to the third, as the difference between the 1st and 2d is to the difference between the 2d and 3d; or in four terms when the 1st is to the 4th, as the difference between the 1st and 2d is to the difference between the 3d and 4th;

or the reciprocals of an arithmetical proportion are in harmonical proportion. As 6, 4, 3; because  $6 : 3 :: 6 - 4 = 2 : 4 - 3 = 1$ ; or because  $\frac{1}{6}, \frac{1}{4}, \frac{1}{3}$  are in arithmetical proportion, making  $\frac{1}{6} + \frac{1}{3} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ . Also the four 24, 16, 12, 9 are in harmonical proportion, because  $24 : 9 :: 8 : 3$ . See PROPORTIONALS.

PROPORTION (Compass of), a name by which the French, and some English authors, call the sector.

PROPORTION (Rule of), in arithmetic, a rule by which a 4th term is found in proportion to three given terms. And is popularly called the golden rule, or rule of three.

PROPORTIONS (Animal). The relative magnitudes, shapes and adaptations of the different parts of an animal, upon which his beauty and perfection depend, and by which his powers are materially affected. Many authors have conceived it impossible to lay down any general rules of just proportion for animals; and others have doubted their practical utility, even if it could be done with precision.

There has, more especially, been much dispute upon this subject in regard to a perfect horse; the proportions of which, we are confident, must correspond, although it is unquestionably true that, in the noted horse Eclipse, we have a case which seems to set all calculation at defiance; yet this is to be considered, though a strong, yet as only an extraordinary exception, and proves merely that the application of any general rule should not be indiscriminate. Mr. Feron, in his late System of Farriery, notwithstanding Mr. St. Bel's account of the defective structure of Eclipse, in several particulars, ventures to give the following as the exact and invariable proportions of the best race horses.

He prefaces his account by observing, that the head of a horse, divided into twenty-two parts, has been the usual scale for measuring every other part of the body; but, if the animal's head should appear either too long or too short, as sometimes is the case, he says, that measure must be abandoned, and instead of it we are to take the height of the body from the top of the withers to the ground. On the third part of this measure he relies for ascertaining the just length of every other part of the body; and also for shewing how much the head happens to be defective.

We have endeavoured to exhibit Mr. Feron's demonstrations from his own plates, No. 27, and following, where *w, w, w*, shew what the author denominates a well-made horse, and beautiful in his forehead. He measures three heads and sixteen parts, from the top of the head to the ground, provided the head stands in its natural position, which, however, it is not always easy to ascertain.

*g, g*, Shews the neck, which should measure one head and thirteen parts, from the withers to the top of the head. The same measure is given for the length of the neck, from the top of the head to its junction with the chest.

*a, a, a*, Shews the height of the body, which should measure three heads, from the withers

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to the ground. The same measure holds good from the rump to the ground, which Mr. Feron says exposes the false idea of making horses appear higher before than behind, when they are to be viewed.

*b, b, b, b,* Shews the length of the body, which should measure three heads and four parts, from the point of the shoulder to the posterior part of the buttock of the animal.

*d, d,* Mr. Feron describes as the line which falls from the articulation of the shoulder with the arm. This, which should measure two heads, and seven parts, ought directly to touch the hoof, in front of the toe. "If," says he, "the foot should stand before this line, the leg will be in an oblique direction forward, which structure will confine the horse in all its actions, because the fore-legs are obliged to come upon the ground nearly the same way as those of a horse on the descent (or going down hill), that is to say, the heels will touch the ground first, instead of the toes; but if the legs stand obliquely backwards from above, which is the opposite defect before-mentioned, the case is a deal worse, because the animal is continually stumbling, and even falling, on account of the feet being drawn too much under the belly, which situation obliges him to support too great a weight of the body. When this defect originates from the knees only, it bends the legs more or less, in which case the horse is called bow-legged. In either case, such an animal must be rejected, and considered as unfit for the turf."

In *e, e,* we have the line which falls from the top of the fore-leg to the point of the heel. This line, which should measure one head and twenty parts, is intended to show the importance of a perfect perpendicular position of the fore-leg.

*f, f,* Is the distance from the top of the withers to the stifle, which ought to measure one head and twenty parts. By the same measure the distance from the rump to the elbow may be determined.

*h,* In width, the neck should measure one head from the top of the withers to the point of the shoulder.

*i, i,* Shows the narrowest part of the neck, and the breadth of the head taken a little below the eyes. The measure given for these is twelve parts of a head each.

In thickness, the body, from the middle of the back to that of the belly, is stated at one head and two parts. *c, c, c,* A continuation of the same line to the ground, shows the animal's centre of gravity.

*k, k,* The distance from the root of the tail to the stifle, should measure one head and four parts. A repetition of these letters shows first, the length from the stifle to the hock; secondly, the distance from the hock to the ground.

By *m,* the breadth of the fore-arm may be ascertained. This, if taken from the anterior parts to the elbow, should measure eleven parts of a head. *m,* In the hinder parts, gives the breadth of one of the legs, taken just under the fold of the buttock.

*n,* Shows the breadth of the hock, taken from its anterior part to the top of the os calcis. This measures seven parts of a head. The same measure (sideway) gives the breadth of the head, above the nostrils.

The forehead, in breadth, taken from one eye to the other, should measure seven parts of a head. The same gives the distance between the fore-legs.

In a well-proportioned horse, the knees, in thickness, should measure five parts of a head; and the same measure gives the breadth of the fore-legs, just above the knees, as at *l*.

*p,* Is the breadth of the hind fetlock joints, which should be four parts of a head.

*t,* The fore-pasterns, which should measure two parts of a head and three-quarters.

*v, v,* The breadth of the coronet. This should measure four and a half parts of a head.

*o,* The breadth of the hinder legs or shank-bones, viz. three parts of a head.

*r,* In breadth, the fore-legs should measure two parts of a head and three-quarters.

*a, a, a,* Is a perpendicular line, which falls from the articulation of the stifle. "This," says Mr. Feron, "should touch the ground at the distance of half a head from the toe. Too far or too near this direction proves the hock defective. If the hind feet advance too much under the belly, the hocks must be proportionably bent, and the weight of the body overcharging them, will of course increase the deformity. The feet being too much under the belly will render it impossible for them to cover much ground; therefore their steps will be very much confined. The extension of the hocks terminating almost in an upright direction, will rather serve to raise the body than to push it forward.

"If, on the contrary, the hind feet stand too far behind this line, the hocks will be too strait, and their flexion too confined. The extension of the hinder parts taking place only in a perpendicular direction backward, will produce a defect capable of retarding the speed."

The author is aware of the general opinion, of those who are deemed good judges of horses, that the hind feet ought never to pass over the fore feet, but this he thinks erroneous. "Nevertheless," says he, "it is an obvious fact, that the extension of the hind quarters, and the freedom in the action of the hind legs, in a well-bred horse, convey the hind-feet very much beyond the fore-feet; and this I know to be the case with every animal which nature has designed for speed. A bad organization in the structure of the hock gives also a bad direction to the feet, by turning them inwards or outwards; in either case it is precisely ascertained that the legs lose more or less of their power, because they do not perform their actions upon the line of the body; therefore such mechanism must be considered as a fault in hunters or racers, &c."

Mr. Feron observes here, that a bad organization in the thigh bone, as in case of its inclin-



ing outwards, gives a bad direction to all the rest of the limb, by bringing the point of the hocks together, and tending to turning the feet outwards

"But," says he, "whether the hock bends outwards or inwards, the fault is considerable in either case, for the reason already observed, that the legs cannot move upon the line of the body. The croup will waver to the right and left; of course, a horse of this kind will labour a great deal more than one whose proportion is good: besides, all these lateral motions are absolutely contrary to the actions of a good horse; for which reason I recommend to every one to be very particular in a true and exact proportion in the hind legs, inasmuch as the slightest defect in this part must effectually retard the speed. It is not so bad with regard to the fore-leg, whose function is rather to support the body than push it forwards."

Mr. Feron contends that the foregoing proportions must unavoidably exist in a thoroughbred horse, and that they indeed constitute the most beautiful and important quality of his structure: and any one who gives to the subject the necessary degree of attention, will soon discover those proportions in a horse which indicate superior activity and speed. To render this more easy, the author, after supposing the different organs defective in their proportions, endeavours to point out the consequences resulting from defects in the head, neck, back, loins, chest, &c. These minutiae, however, can only be effectually understood by consulting the work itself, and the plates to which we have referred, which are 27 and following.

Mr. St. Bel, in his elaborate Essay on the Proportions of Eclipse, preceded Mr. Feron in the plan of calculating the powers of progression. The points in which that celebrated racer differed from the standard of general excellence may be ascertained by a comparison of the foregoing with Mr. St. Bel's account, where will be found a second plate, which represents the motions of the legs.

It appears, that the height and length of Eclipse were, from the withers to the ground, 66 inches. His height from the top of the rump to the ground 67 inches. The length of his body, taken from the most prominent part of the breast to the extremity of the buttocks, 69 inches.

The length of the bones which composed his limbs, is stated thus:

| <i>Fore legs.</i>                  | Inches. |
|------------------------------------|---------|
| The shoulder blade                 | 18      |
| The humerus or arm                 | 12      |
| The cubitus or fore-arm            | 16      |
| The canon or shank                 | 12      |
| The pastern, the coronet, and foot | 7       |

| <i>Hind legs.</i>                  | Inches. |
|------------------------------------|---------|
| The os-ilium                       | 12      |
| The femur                          | 15      |
| The tibia                          | 19      |
| The shank or leg                   | 14      |
| The pastern, the coronet, and foot | 9       |

Mr. St. Bel describes the extent of flexion in the several parts which composed the extremities in Eclipse thus:

## 1. In the fore extremities.

"The shoulder describes the portion of a circle equal to 40 degrees, both forward and backward; the centre of its motion being in the middle of the shoulder blade.

"The humerus, or arm, represented in the centre of flexion backward, describes 40 degrees in its action.

"The cubitus, or fore-arm, taken at the beginning of its flexion forward, describes 90 degrees in its action.

"The shank, or canon, at the commencement of its flexion backward, describes 90 degrees in its action.

"The pastern, coronet, and foot, describe one with another, in their flexion backward, 100 degrees."

## 2. In the hinder extremities.

"The haunch, or os ilium, bending upward and downward, describes 30 degrees in its action.

"The femur, or thigh bone, taken in the middle of its flexion forward, describes 50 degrees.

"The tibia, at one third of its flexion backward, describes, in the whole, 80 degrees.

"The shank, in the beginning of its flexion forward, describes 100 degrees.

"The pastern, coronet, and foot, describe, one with another, 100 degrees in their action."

From this statement, Mr. St. Bel shows, "that the legs of Eclipse, in their flexion in the gallop, described each a circle of 360 degrees; and, consequently, the extent of the action of each leg was the same in the extension.

"To this," says he, "must be added the force of action, without which a horse cannot even walk. This force depends chiefly on the power of the muscles, and can only be computed by experiment; since they are animated organs, which move parts merely mechanical: but, in allowing Eclipse a good muscular organization, which he certainly possessed, we may, examining the length and direction of his legs, and the greatness and openness of the angles, formed by the alternate disposition of the bones which composed his extremities, pronounce with the greatest probability, that Eclipse, free of all weight, and galloping at liberty in his greatest speed, could cover an extent of 25 feet at each complete action on the gallop; that he could repeat this action twice and one-third in each second; consequently, that, employing without reserve all his natural and mechanical faculties on a straight line, he could run nearly four miles in the space of six minutes and two seconds."

The author shows, by a diagram, six complete actions of the gallop. In these the four prints of the feet of Eclipse, which are marked

before and behind, show where he placed his hind and fore feet in the gallop.

The professor's succeeding remarks on the defects observable in the construction of the several parts of this extraordinary animal are too much in detail to admit even of abridgment, within a moderate compass. The reader of them, however, though he may have his doubts as to the accuracy of this mode of calculating the powers of a living animal, will not fail, at least, to admire the ingenuity of the attempt.

**PROPORTIONABLE.** *a.* (from *proportion*.) Adjusted by comparative relation; such as is fit (*Tillotson*).

**PROPORTIONABLY.** *ad.* (from *proportion*.) According to proportion; according to comparative relations (*Rogers*).

**PROPORTIONAL.** *a.* (*proportionel*, Fr.) Having a settled comparative relation; having a certain degree of any quality compared with something else (*Newton*).

**PROPORTIONAL COMPASSES.** See **COMPASSES**.

**PROPORTIONAL PART,** is a part of some number that is analogous to some other part or number; such as the proportional parts in the logarithms, and other tables.

**PROPORTIONAL SCALES,** called also **Logarithmic scales,** are the logarithms, or artificial numbers, placed on lines, for the ease and advantage of multiplying and dividing, &c. by means of compasses, or of sliding rulers. These are in effect so many lines of numbers, as they are called by Gunter, but made single, double, triple, or quadruple; beyond which they seldom go. See **GUNTER'S SCALE, SCALE,** &c.

**PROPORTIONAL SPIRAL.** See **SPIRAL**.

**PROPORTIONALITY.** *s.* (from *proportional*.) The quality of being proportional (*Grew*).

**PROPORTIONALLY.** *ad.* (from *proportional*.) In a stated degree (*Newton*).

**PROPORTIONALS,** are the terms of a proportion; consisting of two extremes, which are the first and last terms of the set, and the means, which are the rest of the terms. These proportionals may be either arithmeticals, geometricals, or harmonicals, and in any number above two, and also either continued or discontinued.

Pappus gives this beautiful and simple comparison of the three kinds of proportionals, arithmetical, geometrical, and harmonical, viz. *a, b, c*, being the first, second and third terms in any such proportion, then

$$\left. \begin{array}{l} \text{In the arithmeticals, } a : a \\ \text{In the geometricals, } a : b \\ \text{In the harmonicals, } a : c \end{array} \right\} :: a - b : b - c.$$

See **MEAN PROPORTIONAL**.

Continued proportionals form what is called a **progression**; for the properties of which see **ARITHMETICAL, GEOMETRICAL, and HARMONICAL**.

When four quantities are in proportion, they are also in proportion by inversion, compo-

sition, division, &c.; thus, *a, na, b, nb*, being in proportion, viz.,

1.  $a : na :: b : nb$ ; then by
2. Inversion  $na : a :: nb : b$ ;
3. Alternation  $a : b :: na : nb$ ;
4. Composition  $a + na : na :: b + nb : nb$ ;
5. Conversion  $a + na : a :: b + nb : b$ ;
6. Division  $a - na : a :: b - nb : b$ ;

**PROPORTIONATE.** *a.* (from *proportion*.) Adjusted to something else, according to a certain rate or comparative relation (*Grew*).

**TO PROPORTIONATE.** *v. a.* (from *proportion*.) To adjust according to settled rates to something else (*Bentley*).

**PROPORTIONATENESS.** *s.* (from *proportionate*.) The state of being by comparison adjusted (*Hale*).

**PROPOSAL.** *s.* (from *propose*.) 1. Scheme or design propounded to consideration or acceptance (*Addison*). 2. Offer to the mind (*South*).

**TO PROPOSE.** *v. a.* (*proposer*, Fr.) To offer to the consideration (*Watts*).

**TO PROPOSE.** *v. n.* To lay schemes (*Shakespeare*).

**PROPOSER.** *s.* (from *propose*.) One that offers any thing to consideration (*Swift*).

**PROPOSITION.** *s.* (*proposition*, French; *propositio*, Latin.) 1. One of the three parts of a regular argument (*White*). 2. A sentence in which any thing is affirmed or decreed (*Hammond*). 3. Proposal; offer of terms (*Clarendon*).

**PROPOSITION,** in logic, part of an argument wherein some quality, either negative or positive, is attributed to a subject, as, "God is just." While the comparing of our ideas is considered merely as the act of the mind, assembling them together, and joining or disjoining them according to the result of its perceptions, this operation is called judgment. But when these judgments are expressed in words, they then bear the name of propositions. Hence a proposition is a sentence expressing some judgment of the mind, whereby two or more ideas are affirmed to agree or disagree: and as our judgments include at least two ideas, one of which is affirmed or denied of the other; so a proposition must have terms corresponding to these ideas. The idea of which we affirm or deny, and of course the term expressing that idea, is called the subject of the proposition; and the idea affirmed or denied, as also the term answering to it, is called its predicate; thus in the proposition, God is omnipotent, God is the subject, it being of him that we affirm omnipotence; and omnipotent is the predicate, because we affirm the idea expressed by that word to belong to God.

**PROPOSITION,** in mathematics, is either some truth advanced and shown to be such by demonstration, or some operation proposed and its solution shown. If the proposition be deduced from several theoretical definitions compared together, it is called a theorem; if from



a praxis, or series of operations, it is called a problem.

**PROPOSITION**, in poetry, the first part of a poem wherein the author proposes briefly, and in general, what he is to say in the body of his work. It should comprehend only the matter of the poem, that is, the action and the persons that act. Horace prescribes modesty and simplicity in the proposition, and would not have the poet promise too much, nor raise in the reader too great ideas of what he is going to relate.

**PROPOSITIONAL**. *a.* (from *proposition*.) Considered as a proposition (*Watts*).

**To PROPOUND**. *v. a.* (*propono*, Latin.) 1. To offer to consideration; to propose (*Wotton*). 2. To offer; to exhibit (*Shakspeare*).

**PROPOUNDER**. *s.* (from *propound*.) He that propounds; he that offers; proposer.

**PROPRIETARY**. *s.* (*proprietaire*, Fr. from *propriety*.) Possessor in his own right (*Government of the Tongue*).

**PROPRIETARY**. *a.* Belonging to a certain owner (*Grew*).

**PROPRIETOR**. *s.* (from *proprius*, Latin.) A possessor in his own right (*Rogers*).

**PROPRIETRESS**. *s.* (from *proprietor*.) A female possessor in her own right (*L'Es-trange*).

**PROPRIETY**. *s.* (*proprietas*, Latin.) 1. Peculiarity of possession; exclusive right (*Suckling*). 2. Accuracy; justness (*Locke*).

**PROPT**. for *propped*. (from *prop*.) Sustained by some prop (*Pope*).

**PROPTOMA**. (*proptoma*, *προπτωμα*, from *προπτωω*, to fall down.) A relaxation of the scrotum, of the under lip, of the breasts in females, of the præpæ, or of the ears.

**To PROPUGN**. *v. a.* (*propugno*, Latin.) To defend; to vindicate (*Hammond*).

**PROPUGNATION**. *s.* (*propugnatio*, from *propugno*, Latin.) Defence (*Shakspeare*).

**PROPUGNER**. *s.* (from *propugn*.) A defender (*Government of the Tongue*).

**PROPULSION**. *s.* (*propulsus*, Latin.) The act of driving forward (*Bacon*).

**PRO NATA**, a mercantile term for in proportion; thus, it is said each person in a joint concern must reap the profit, or sustain the loss, *pro nata* to his interest.

**PRORE**. *s.* (*prora*, Lat.) The prow; the forepart of a ship (*Pope*).

**PROROGATION**. *s.* (*prorogatio*, Latin.)

1. Continuance; state of lengthening out to a distant time; prolongation (*South*). 2. Interruption of the session of parliament by the regal authority (*Swift*).

**To PROROGUE**. *v. a.* (*prorogo*, Latin.) 1. To protract; to prolong (*Dryden*). 2. To put off; to delay (*Shakspeare*). 3. To withhold the session of parliament to a distant time.

**PRORUPTION**. *s.* (*proruptus*, Lat.) The act of bursting out (*Brown*).

**PROSAIC**. *a.* (*prosaïque*, Fr.) Belonging to prose; resembling prose.

**To PROSCRIBE**. *v. a.* (*proscribo*, Latin.)

1. To censure capitally; to doom to destruction (*Roscommon*). 2. To interdict: not in use (*Dryden*).

**PROSCRIBER**. *s.* (from *proscribe*.) One that dooms to destruction (*Dryden*).

**PROSCRIPTION**. *s.* (*proscriptio*, Latin.) Doom to death or confiscation (*B. Jonson*).

**PROSE**. *s.* (*prose*, Fr. *prosa*, Lat.) Language not restrained to harmonic sounds or set number of syllables (*Swift*).

**To PROSECUTE**. *v. a.* (*prosecutus*, Lat.)

1. To pursue; to continue endeavours after any thing (*Milton*). 2. To continue; to carry on (*Hayward*). 3. To proceed in consideration or disquisition of any thing (*Holder*). 4. To pursue by law; to sue criminally.

**PROSECUTION**. *s.* (from *prosecute*.) 1. Pursuit; endeavour to carry on (*South*). 2. Suit against a man in a criminal cause.

**PROSECUTOR**. *s.* (from *prosecute*.) One that carries on any thing; a pursuer of any purpose; one who pursues another by law in a criminal cause.

**PROSELYTE**. *s.* (*προσηλυτῆς*; *proselite*, Fr.) A convert; one brought over to a new opinion (*Cleaveland*).

**To PROSELYTE**. *v. a.* To convert. A bad word (*Government of the Tongue*).

**PROSEMINATION**. *s.* (*proseminatus*, Latin.) Propagation by seed (*Hale*).

**PROSERPINA**, **PROSERPINE**, in fabulous history, a daughter of Ceres by Jupiter, called by the Greeks Persephone. She was so beautiful, that Jupiter himself became enamoured of her. She made Sicily the place of her residence, and delighted in the flowery meadows and limpid streams which beautified the plains of Enna. From this solitary retreat, Pluto carried her away into the infernal regions, of which she became the queen. (See **PLUTO**.) Ceres, disconsolate at the loss of her daughter, travelled all over the world, and, at length, learned from the nymph Arethusa, that her daughter had been carried away by Pluto, whereupon she repaired to Jupiter, and demanded of him to punish the ravisher. Jupiter having in vain attempted to persuade Ceres that Pluto was not unworthy of her daughter, then informed her that Proserpine might return on earth, if she had not taken any aliments in the infernal regions. Unfortunately she had eaten a pomegranate, and Ascalaphus was the only one who saw it. (See **ASCALAPHUS**.) And for his discovery the goddess instantly turned him into an owl. Jupiter, however, to soothe the grief of Ceres, permitted that Proserpine should remain six months with Pluto, and the rest of the year on earth. As queen of hell, and wife of Pluto, Proserpine presided over the death of mankind, and no one could die, if herself, or Atropos (see **PARCÆ**) did not cut off one of the hairs from the head. Proserpine was universally worshipped by the ancients, and was known by the different names of Libitina, Hecate, Juno inferna.

**PROSERPINACA**, in botany, a genus of

the class triandria, order trigynia. Calyx three-parted, superior ; corollous ; nut three-celled. One species ; a marsh-plant of Virginia, with creeping root, and axillary, solitary flowers.

**PROSEUCHE**, in antiquity, properly signifies prayer ; but it is taken for the places of prayer of the Jews, and was pretty near the same as their synagogues. But the synagogues were originally in the cities, and were covered places : whereas, for the most part, the proseuches were out of the cities, and on the banks of rivers ; having no covering, except perhaps the shade of some trees or covered galleries. The word is Greek, *προευχη*, prayer.

**PROSLAMBANOMENE**, the name of a musical note in the Greek system. As the two tetrachords of the Greeks were conjunctive, or, in other words, as the highest note of the first served likewise for the lowest note of the second, it is plain that a complete octave could not be formed. To remedy this deficiency, therefore, one note beneath the lowest tetrachord was added, as an octave to the highest of the last tetrachord. Thus, if we suppose the first to have begun on B, the last must have ended on A, to which one note subjoined immediately beneath the lowest B in the diatonic order must have formed an octave. This note was called *proslambanomene*. But it appears from authors who have scrutinized antiquity with some diligence, and perhaps with as much success as the data upon which they proceeded could produce, that the names of the notes in the Greek system, which originally signified their natural station in the scale of ascending or descending sounds, were afterwards applied to their positions in the lyre. Higher or lower, then, according to this application, did not signify their degrees of acuteness or gravity, but their higher or lower situation upon this instrument.

**PROSO'DIAN**. *s.* (from *prosody*.) One skilled in metre or prosody (*Brown*).

**PROSODY**. *s.* (*προσωδία*.) The part of grammar which teaches the sound and quantity of syllables and the measures of verse.

**PROSOPIS**, in botany, a genus of the class decandria, order monogynia. Calyx hæmispheerical, four-toothed ; stigma simple ; legume many-seeded. One species ; an East Indian tree, with deeply scratched bark ; and long filiform, pendulous pods.

**PROSOPOPŒIA**, a figure in rhetoric, whereby we raise qualities, or things inanimate, into persons. This figure is divided into two parts : 1. when good and bad qualities, accidents, and things inanimate, are introduced as living and rational beings ; as in the following verses of Milton :

————— Now gentle gales,  
Fanning their odoriferous wings, dispense  
Native perfumes ; and whisper whence they  
stole

Those balmy spoils. ———

The second part of this figure is when we give a voice to inanimate things, and make

rocks, woods, rivers, buildings, &c. express the passions of rational creatures, as in the following lines of Spenser.

She foul blasphemous speeches forth did  
cast,

And bitter curses, horrible to tell,  
That ev'n the temple wherein she was  
placed

Did quake to hear, and nigh asunder burst !

**PROSPECT**. *s.* (*prospectus*, Latin.) 1. View of something distant (*Locke*). 2. Place which affords an extended view (*Milton*). 3. Series of objects open to the eye (*Addison*). 4. Object of view (*Prior*). 5. View delineated ; a picturesque delineation of a landscape (*Reynolds*). 6. View into futurity (*Smith*). 7. Regard to something future (*Tillotson*).

To **PROSPECT** *v. a.* (*prospectus*, Lat.) To look forward.

**PROSPECTIVE**. *a.* (from *prospect*.) 1. Viewing at a distance. 2. Acting with foresight (*Child*).

To **PROSPER**. *v. a.* (*prospero*, Lat.) To make happy ; to favour (*Dryden*).

To **PROSPER**. *v. n.* (*prosperer*, French.) 1. To be prosperous ; to be successful (*Isaiah*). 2. To thrive ; to come forward (*Cowley*).

**PROSPERITY**. *s.* (*prosperitas*, Latin ; *prosperité*, French.) Success ; attainment of wishes ; good fortune (*Hooker*).

**PROSPEROUS**. *a.* (*prosperus*, Lat.) Successful ; fortunate (*Milton*).

**PROSPEROUSLY**. *ad.* (from *prosperous*.) Successfully ; fortunately (*Bacon*).

**PROSPEROUSNESS**. *s.* (from *prosperous*.) Prosperity.

**PROSPICIENCE**. *s.* (from *prospicio*, Latin.) The act of looking forward

**PROSTATE GLAND**. (from *πρω*, before, and *στατω*, to stand ; because it is situated before the urinary bladder.) In anatomy, a very large, heart-like, firm gland, situated between the neck and the urinary bladder and bulbous part of the urethra. It secretes the lacteal fluid, which is emitted into the urethra by ten or twelve ducts that open near the verumontanum during coition.

**PROSTATE INFERIOR**. In anatomy. See **TRANSVERSUS PERINEI ALTER**.

**PROSTHAPHERESIS**. In astronomy. See **EQUATION OF THE CENTRE**.

To **PROSTITUTE**. *v. a.* (*prostituto*, Lat. *prostituer*, Fr.) 1. To sell to wickedness ; to expose to crimes for a reward (*Addison*). 2. To expose upon vile terms (*Tillotson*).

**PROSTITUTE**. *a.* (*prostitutus*, Latin.) Vicious for hire ; sold to infamy or wickedness ; sold to whoredom (*Prior*).

**PROSTITUTE**. *s.* (from the verb.) 1. A hireling ; a mercenary ; one who is set to sale (*Dryden*). 2. A public strumpet (*Dryden*).

**PROSTITUTION**. *s.* (*prostitution*, Fr.) 1. The act of setting to sale ; the state of being set to sale. 2. The life of a public strumpet. (*Addison*)



**PROSTRATE.** *a.* (*prostratus*, Latin.) 1. Lying at length (*Fairfax*). 2. Lying at mercy (*Shakspeare*). 3. Thrown down in humblest adoration (*Hooker*).

**To PROSTRATE.** *v. a.* (*prostratus*, Latin.) 1. To lay flat; to throw down (*Hayward*). 2. To throw down in adoration (*Duppa*).

**PROSTRATION.** *s.* (from *prostrate*.) 1. The act of falling down in adoration (*South*). 2. Dejection; depression (*Arbutnot*).

**PROSTYLE.** *s.* (*προστυλή*.) A building that has only pillars in the front.

**PROSYLLOGISM.** *s.* (*pro* and *sylogism*.) A *prosylogism* is when two or more syllogisms are so connected together, that the conclusion of the former is the major or the minor of the following (*Watts*).

**PROTAGORAS,** a Greek philosopher of Abdera, was at first a potter.—He became the disciple of Democritus, on whose system he grafted atheism, and wrote a book in defence of it which was publicly burnt at Athens, and the author banished. He died in Sicily about 400 B. C.

**PROTASIS.** *s.* (*πρωτασις*.) 1. A maxim or proposition. 2. In the ancient drama, the first part of a comedy or tragedy that explains the argument of the piece.

**PROTATIC.** *a.* (*protatique*, Fr. *πρωτατικός*.) Previous (*Dryden*).

**PROTEA.** Silver tree. In botany, a genus of the class tetandria, order monogynia. Corol four-cleft, or four-petalled; anthers linear, inserted beneath the tip of the petals; without proper calyx; nut one-seeded, superior. Sixty-five species; almost all Cape plants. They may be thus subdivided into sections

- A. Leaves pinnate, filiform.
- B. Leaves toothed, callous.
- C. Leaves filiform, subulate.
- D. Leaves linear.
- E. Leaves elliptic and lanceolate.
- F. Leaves oblong, ovate.
- G. Leaves roundish.

The two following are cultivated.

1. *P. conferta*. Cone-bearing protea. Stem erect, three feet high, with whorled subdivided branches; leaves terminated by a concave smooth gland; cone tomentose, ovate, size of a pea; floral leaves concolour.

2. *P. argentea*. Silvery protea. Strong upright stalk, covered with a purplish bark dividing into several branches which grow erect; leaves broad, shining, silvery, making a fine appearance when intermixed with other exotics; flowers in August.

Both these are sometimes raised from cuttings; but more generally by seeds obtained from the Cape.

**To PROTECT.** *v. a.* (*protectus*, Latin; *proteger*, French.) To defend; to cover from evil; to shield (*Milton*).

**PROTECTION.** *s.* (*protection*, French.) 1. Defence; shelter from evil (*Swift*). 2. A passport; exemption from being molested (*Kettlewell*).

**PROTECTIVE.** *a.* (from *protect*.) Defensive; sheltering (*Thomson*).

**PROTECTOR.** *s.* (*protecteur*, French.) 1. Defender; shelterer; supporter; one who shields from evil; guardian (*Waller*). 2. An officer who had heretofore the care of the kingdom in the king's minority (*Shakspeare*). Every Catholic nation, and every religious order, had a protector residing at the court of Rome, who was cardinal, and was called the cardinal protector. Protector is also sometimes used for a regent of a kingdom, made choice of to govern it during the minority of a prince. Cromwell assumed the title and quality of lord protector of the commonwealth of England, &c.

**PROTECTRESS.** *s.* (*protectrice*, French.) A woman that protects (*Bacon*).

**To PROTEND.** *v. a.* (*protendo*, Lat.) To hold out; to stretch forth (*Dryden*).

**PROTERVITY.** *s.* (*protervitas*, Lat.) Peevishness; petulance.

**PROTESILAUS,** a king of part of Thessaly, son of Iphiclus, married Laodamia, the daughter of Acastus, and sometime after departed for the Trojan war with 40 sail. He was the first of the Greeks who set foot on the Trojan shore, and as such he was doomed by the oracle to perish, as soon as he had leaped from his ship. Homer has not mentioned the person who killed him. His wife Laodamia destroyed herself, when she heard of his death. (See *LAODAMIA*.) He was buried on the Trojan shore.

**To PROTEST.** *v. n.* (*protestor*, Latin.) To give a solemn declaration of opinion or resolution (*Denham*).

**To PROTEST.** *v. a.* 1. To prove; to show; to give evidence of: not used (*Shakspeare*). 2. To call as a witness (*Milton*).

**PROTEST.** *s.* (from the verb.) A solemn declaration of opinion against something.

**PROTEST**, in law, is a call of witness, or an open affirmation that a person does, either not at all, or but conditionally, yield his consent to any act, or to the proceeding of any judge in a court in which his jurisdiction is doubtful, or to answer upon his oath further than he is bound by law. Any of the lords in parliament have a right to protest their dissent to any bill passed by a majority; which protest is entered in form. This is said to be a very ancient privilege. The commons have no right to protest. See *PARLIAMENT*.

**PROTEST**, in commerce, a summons written by a notary-public to a merchant, banker, or the like, to accept or discharge a bill of exchange drawn on him, after his having refused either to accept or pay it. See *BILL OF EXCHANGE*.

**PROTESTANT**, a name first given in Germany to those who adhered to the doctrine of Luther; because in 1529, they protested against a decree of the emperor Charles V. and the diet of Spire; declaring that they appealed to a general council. The same name has also been given to those of the sentiments of Calvin; and is now become a common denomination for all those who belong to the reformed churches.

**PROTESTANT.** *a.* (from *protest.*) Belonging to protestants (*Addison*).

**PROTESTATION.** *s.* (*protestation*, Fr.) A solemn declaration of resolution, fact, or opinion (*Hooker*).

**PROTESTER.** *s.* (from *protest.*) One who protests; one who utters a solemn declaration.

**PROTEUS**, a sea deity, son of Oceanus and Tethys, or according to some, of Neptune and Phœnice. He received the gift of prophecy from Neptune. He generally resided in the Carpathian sea, and reposed himself on the shore. He was difficult of access; and, when consulted, he refused to give answers, by immediately assuming different shapes, and eluding the grasp. Aristæus was in the number of those who consulted him, as also Hercules. Some suppose that he was originally a king of Egypt, known among his subjects by the name of Cetes.

**PROTHONOTARY**, a term which properly signifies first notary, and which was anciently the title of the principal notaries of the emperors of Constantinople.

Prothonotary, with us, is used for an officer in the court of king's bench and common pleas; the former of which courts has one, and the latter three. The prothonotary of the king's bench records all civil actions sued in that court, as the clerk of the crown-office does all criminal causes. The prothonotaries of the common pleas enter and enrol all declarations, pleadings, assizes, judgments, and actions: they also make out all judicial writs, except writs of *habeas corpus*, and *distringas jurator*, for which there is a particular office, called the *habeas corpora office*: they likewise enter recognizances acknowledged, and all common recoveries; make exemplifications of records, &c.

**PROTO**, a Greek term, frequently used in composition of priority: thus, proto-collum, in the ancient jurisprudence, signifies the first leaf of a book; proto-martyr, the first martyr; proto-plast, the first man formed, &c.

**PROTOGENES**, a painter of Rhodes, about 328 years B. C. originally very poor. His countrymen were ignorant of his ingenuity before Apelles came to Rhodes, and offered to buy his pieces. Protopogenes was employed for seven years in finishing a picture of Jalyus, a celebrated huntsman. He was to represent in the piece a dog panting, and with froth at his mouth, but this he never could do with satisfaction to himself; and, when all his labours seemed to be without success, he threw his sponge in anger upon the piece. Chance alone perfected what labour could not; the fall of the sponge upon the picture represented the froth at the mouth of the dog in the most natural manner, and the piece was universally admired. When Demetrius took Rhodes, the painter was found closely employed in finishing a picture; and when the conqueror asked him, why he showed not more concern at the general calamity? He replied, "Demetrius made war against the Rhodians, and not against the fine arts."

**PROTOTYPE.** *s.* (*πρωτοτυπον*.) The original of a copy; exemplar; archetype (*Stillingfleet*).

**To PROTRACT.** *v. a.* (*protractus*, Lat.) To draw out; to delay; to lengthen; to spin to length (*Knolles*).

**PROTRACT.** *s.* (from the verb.) Tedious continuance (*Spenser*).

**PROTRACTER.** *s.* (from *protract.*) 1. One who draws out any thing to a tedious length. 2. A mathematical instrument for taking and measuring angles. See **PROTRACTOR**.

**PROTRACTIION.** *s.* (from *protract.*) The act of drawing to length (*Daniel*).

**PROTRACTIVE.** *a.* (from *protract.*) Dilatory; delaying; spinning to length (*Shakspeare*).

**PROTRACTOR** is the name of an instrument used for protracting or laying down on paper the angles of a field, or other figure. The protractor is a small semicircle of brass, or other solid matter, the limb or circumference of which is nicely divided into one hundred and eighty degrees: it serves not only to draw angles on paper, or any plane, but also to examine the extent of those already laid down. For this last purpose, let the small point in the centre of the protractor be placed above the angular point, and let the side coincide with one of the sides that contain the angle proposed; then the number of degrees cut off by the other side, computing on the protractor, will show the quantity of the angle that was to be measured. See **MENSURATION**.

Protractors are now more usually made in the form of a parallelogram, and properly graduated at the upper edge.

**PROTREPTICAL.** *a.* (*προτρεπτικός*.) Hortatory; suatory (*Ward*).

**To PROTRUDE.** *v. a.* (*protrudo*, Latin.) To thrust forward (*Woodward*).

**To PROTRUDE.** *v. n.* To thrust itself forward (*Bacon*).

**PROTRUSION.** *s.* (*protrusus*, Lat.) The act of thrusting forward; thrust; push (*Locke*).

**PROTUBERANCE.** *s.* (*protubero*, Lat.) Something swelling above the rest; prominence; tumour (*Hale*).

**PROTUBERANT.** *a.* (from *protubero*.) Swelling; prominent (*Ray*).

**To PROTUBERATE.** *v. n.* (*protubero*, Lat.) To swell forward; to swell out beyond the parts adjacent (*Sharp*).

**PROUD.** *a.* (*ppude*, or *ppuz*, Saxon.) 1. Too much pleased with himself (*Watts*). 2. Elated; valuing himself (*Dryden*). 3. Arrogant; haughty; impatient (*Milton*). 4. Daring; presumptuous (*Drayton*). 5. Lofty of mien; grand of person (*Milton*). 6. Grand; lofty; splendid; magnificent (*Bacon*). 7. Ostentatious; specious; grand (*Shakspeare*). 8. Salacious; eager for the male (*Brown*). 9. Fungous; exuberant (*Arbutnot*).

**PROUDLY.** *ad.* (from *proud*.) 1. Arrogantly; ostentatiously; in a proud manner (*Dryden*). 2. With loftiness of mien (*Milton*).

**To PROVE.** *v. a.* (*probo*, Latin; *prouwer*,



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French.) 1. To evince; to show by argument or testimony (*Atterbury*). 2. To try to bring to the test (*Sandys*). 3. To experience (*Milton*). 4. To endure; to try by suffering or encountering (*Davies*).

**TO PROVE.** *v. n.* 1. To make trial (*Bacon*). 2. To be found by experience (*Shakspeare*). 3. To succeed (*Bacon*). 4. To be found in the event (*Waller*).

**PROVEABLE.** *a.* (from *prove*.) That may be proved.

**PROVEDITOR.** **PROVEDO'RE.** *s.* (*providitore*, Italian.) One who undertakes to procure supplies for an army (*Friend*).

**PROVENCE**, a late province of France, 138 miles long and 100 broad; bounded on the N. by Dauphiny, E. by the Alps and the river Var, S. by the Mediterranean, and W. by Languedoc. In that which was called Upper Provence, the soil is fertile in corn and pastures; but in Lower Provence, dry and sandy. It produces, however, wine, oil, figs, almonds, prunes, and pomegranates, along the seacoast from Toulon to Nice. There are orange and citron-trees in the open fields; and many medicinal plants, mineral waters, and mines of several kinds. Provence now forms the departments of Var, Lower Alps, and Mouths of the Rhone.

**PROVENDER.** *s.* (*provende*, Fr.) Dry food for brutes; hay and corn (*Shakspeare*).

**PROVENZALE** (Marcello), an Italian painter, born in 1575, and died in 1639. He became eminent as a painter of history and portrait, but his superior merit consisted in mosaic, which he executed with astonishing beauty.

**TO PROVERB.** *v. a.* Not a good word. 1. To mention in a proverb (*Milton*). 2. To provide with a proverb (*Shakspeare*).

**PROVERB**, (*proverbium*), is defined, by Camden, a concise, witty, and wise speech, grounded upon long experience; and containing, for the most part, some useful caveat. Such are, A close mouth catches no flies.—A high building, a low foundation.—A carrion kite will never be a good hawk.—A short horse is soon carried.—A man may love his house well, though he ride not on the ridge.—A false knave needs no broker.—Better to spare at brim, than at bottom.—A still tongue makes a wise head.—The scalded cat dreads cold water.—Let a man do *you* an injury, and *he* will never forgive *you*.—He that's ungrateful has no fault but one.—Fast bind, fast find.—A pin saved each day, makes ten pence in a year.—Take care of the pence, and the pounds will take care of themselves.—The rolling stone gathers no moss.—Three removes are as bad as a fire, &c. &c. &c.

**PROVERBS** (Book of), a canonical book of the Old Testament, containing a part of the proverbs of Solomon, the son of David, king of Israel. The first twenty-four chapters are acknowledged to be the genuine work of that prince; the next five chapters are a collection of several of his proverbs, made by order of king Hezekiah; and the two last seem to have

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been added, though belonging to different and unknown authors, Agur the son of Jakeh, and king Lemuel. In this excellent book are contained rules for the conduct of all conditions of life; for kings, courtiers, masters, servants, fathers, mothers, children, &c.

**PROVERBIAL.** *a.* (*proverbial*, French.)

1. Mentioned in a proverb (*Temple*). 2. Resembling a proverb; suitable to a proverb (*Brown*). 3. Comprised in a proverb (*Pope*).

**PROVERBIALLY.** *ad.* In a proverb (*Brown*).

**TO PROVIDE.** *v. a.* (*provideo*, Latin.) 1. To procure beforehand; to get ready; to prepare (*Milton*). 2. To furnish; to supply (*Bacon*). 3. To stipulate; to make a conditional limitation. 4. *To PROVIDE against.* To take measures for contracting or escaping any ill (*Hale*). 5. *To PROVIDE for.* To take care of beforehand (*Shakspeare*).

**PROVIDED that.** Upon these terms; this stipulation being made (*L'Estrange*).

**PROVIDENCE.** *s.* (*providentia*, Latin.) 1. Foresight; timely care; forecast; the act of providing (*Sidney*). 2. The care of God over created beings; divine superintendence (*Raleigh*). 3. Prudence; frugality; reasonable and moderate care of expense (*Dryden*).

**PROVIDENCE** in the second of the above acceptations has been acknowledged by the majority of men in all ages. Every altar that is erected, every prayer and every sacrifice that is offered up, affords a proof of this belief. So fully have men been convinced of the sincerity of each other's faith upon this subject, that in one form, that of an appeal to the Divine Ruler of the world, by the solemnity of an oath, they have introduced it both into the most ordinary and the most important business of life.

This universal conviction of men of all degrees of knowledge, from the most profound philosopher to the rudest barbarian, is probably to be traced to some primæval tradition, never totally effaced from any nation under heaven. The truth itself, however, is susceptible of the most complete proof from principles of science. If the world had a beginning, it may obviously have an end, and can be continued in existence only by the constant energy of that power by which it was at first created. He therefore who acknowledges a creation and denies a providence, involves himself in this palpable contradiction—"that a system, which of itself had not an original and momentary existence, may yet of itself have a perpetual existence; or that a being which cannot of itself exist for a second of time, may yet, of itself, exist for thousands of years!"

Simplicius argues thus for a providence: if God do not look to the affairs of the world, it is either because he cannot, or will not; but the first is absurd, since to govern cannot be difficult, where to create was easy; and the latter is both absurd and blasphemous.

The sentiments of Cicero are likewise very precise and pertinent to this purpose: he thinks it impossible for one who duly considers the

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innumerable objects of the universe, and their invariable order and beauty, to entertain the least doubt but that there is some efficient cause who presides over and directs the mighty fabric! Nay he lays it down as a fundamental principle of all societies, that there is a divine providence which directs all events, observes the actions of mankind, whether good or bad, discerns the very intentions of the heart, and will certainly make a difference between good men and the wicked.

Some admirable arguments in favour of what is usually called a particular providence, are given in Wollaston's *Religion of Nature Delineated*; they are transcribed by Dr. Gregory in his essay on the same subject in his *Letters on the Christian Religion*. A very excellent work on Providence was written by Char-nock.

PROVIDENCE, one of the Bahama islands, and the best of those planted by the English. It was taken by the Spaniards in 1782, but retaken the next year. The chief town is Nassau. Lon. 77. 20 W. Lat. 25. 3 N.

PROVIDENCE, an island in the Atlantic, which the bucaniers fortified, but afterward abandoned. It is 150 miles E. of the coast of Nicaragua. Lon. 80. 44 W. Lat. 13. 25 N.

PROVIDENCE, a river that rises in the state of Massachusetts, and waters the town of Providence, whence it is navigable for ships to Narraganset bay, which it enters on the W. side of Rhode island.

PROVIDENCE, the oldest town of the state of Rhode island, chief of a county of its name, and the semi-capital of the state. It has several manufactures, and a large foreign and inland trade. Here are six edifices for public worship; a handsome court-house, in which is a library for the use of the town and county; and a flourishing seminary, called Rhode Island College. Providence is seated on both sides of the river of the same name, 30 miles N.W. of Newport. Lon. 71. 26 W. Lat. 41. 51 N.

PROVIDENT. *a.* (*providens*, Lat.) Forecasting; cautious; prudent with respect to futurity (*Waller*).

PROVIDENTIAL. *a.* (from *providence*.) Effected by providence; referrible to providence (*Woodward*).

PROVIDENTIALLY. *a.* (from *providential*.) By the care of providence (*Addison*).

PROVIDENTLY. *ad.* (from *provident*.) With foresight; with wise precaution (*Boyle*).

PROVIDER. *s.* (from *provide*.) He who provides or procures (*Shakspeare*).

PROVINCE. *s.* (*province*, Fr. *provincia*, Latin.) 1. A conquered country; a country governed by a delegate (*Temple*). 2. The proper office or business of any one (*Otway*). 3. A region; a tract (*Watts*).

PROVINCE, in Roman antiquity, a country of considerable extent, which, upon being entirely reduced under the Roman dominion, was new-modelled according to the pleasure of the conquerors, and subjected to the command

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of annual governors, sent from Rome; being commonly obliged to pay such taxes and contributions as the senate thought fit to demand. Of these countries, that part of France next the Alps was one, and still retains the name of Provence. Nicod derives the word *a procul vivendo*, living afar off; but it is better deduced from *pro* and *vinco*, I overcome.

PROVINCE, in geography, a division of a kingdom or state, comprising several cities, towns, &c. all under the same government, and usually distinguished by the extent either of the civil or ecclesiastical jurisdiction. The church distinguishes its provinces by archbishoprics; in which sense, England is divided into two provinces, Canterbury and York.

PROVINCIAL. *a.* (*provincial*, French.) 1. Relating to a province (*Shakspeare*). 2. Appendant to the principal country (*Brown*). 3. Not of the mother country; rude; unpolished (*Dryden*). 4. Belonging only to an archbishop's jurisdiction; not oecumenical (*Ayliffe*).

PROVINCIAL. *s.* (*provincial*, French, from *province*.) A spiritual governour (*Stillingfleet*).

To PROVINCIATE. *v. a.* (from *province*.) To turn to a province: not in use (*Howel*).

PROVINCETOWN, a town of Massachusetts, in Barnstable county, situate on the hook of Cape Cod. Its harbour is one of the best in the state, and was the first port entered by the English, in 1620, when they came to settle in New England. The houses are only one story high, and set upon piles, that the driving sands may pass under them. The inhabitants are wholly dependent on Boston, and the towns in the vicinity, for every vegetable production. It is 50 miles E.S.E. of Boston.

To PROVINCE. *v. n.* (*provigner*, Fr.) To lay a stock or branch of a vine in the ground to take root for more increase.

PROVISION. *s.* (*provision*, French; *provisio*, Latin.) 1. The act of providing beforehand (*Sidney*). 2. Measures taken beforehand (*Tillotson*). 3. Accumulation of stores beforehand; stock collected (*Knolles*). 4. Victuals; food; provender (*Clarendon*). 5. Terms settled; care taken (*Davies*).

PROVISIONAL. *a.* (*provisional*, French; from *provision*.) Temporally established; provided for present need (*Ayliffe*).

PROVISIONALLY. *ad.* (from *provisional*.) By way of provision (*Locke*).

PROVISO. *s.* (Latin.) Stipulation; caution; provisional condition (*Spenser*).

PROVOCACTION. *s.* (*provocatio*, Latin.) 1. An act or cause by which anger is raised (*Smith*). 2. An appeal to a judge (*Ayliffe*).

PROVOCATIVE. *s.* (from *provoke*.) Any thing which revives a decayed or cloyed appetite (*Addison*).

PROVOCATIVENESS. *s.* (from *provocative*.) The quality of being provocative.

To PROVOKE. *v. a.* (*provoco*, Latin.) 1. To rouse; to excite by something offensive;



to awake (*Dryden*). 2. To anger; to enrage; to offend; to incense (*Clarendon*). 3. To cause; to promote (*Arbuthnot*). 4. To challenge (*Dryden*). 5. To induce by motive; to move; to incite (*Burnet*).

**TO PROVO'KE.** *v. n.* 1. To appeal. A latinism (*Dryden*). 2. To produce anger (*Taylor*).

**PROVO'KER.** *s.* (from *provoke*.) 1. One that raises anger (*Gov. of the Tongue*). 2. Causer; promoter (*Shakspeare*).

**PROVO'KINGLY.** *ad.* (from *provoking*.) In such a manner as to raise anger (*Decay of Piety*).

**PRO'VOST.** *s.* (*pfapart*, Saxon.) 1. The chief of any body: as, the provost of a college (*Fell*). 2. The executioner of an army (*Hayward*).

**PRO'VOST MARSHAL**, an officer of the king's navy, who has charge of the king's prisoners taken at sea.

**PROVOST**, or **PREVOT**, in the king's stables: his office is to attend at court, and hold the king's stirrup, when he mounts his horse, &c. There are four provosts of this kind, each of whom attends in his turn monthly.

**PRO'VOSTSHIP.** *s.* (from *provost*.) The office of a provost (*Hakewill*).

**PROW.** *s.* (*proue*, Fr. *prora*, Lat.) The head or forepart of a ship (*Peacham*).

**PROW.** *a.* Valiant (*Spenser*).

**PRO'WESS.** *s.* (*prouesse*, Fr.) Bravery; valour; military gallantry (*Sidney*).

**PRO'WEST.** *a.* (from *prow*, adjective.) 1. Bravest; most valiant (*Spenser*). 2. Brave; valiant. (from *prowess*.) (*Milton*).

**TO PROWL.** *v. a.* To rove over (*Sidney*).

**TO PROWL.** *v. n.* To wander for prey; to prey; to plunder (*Tusser*).

**PRO'WLER.** *s.* (from *prowl*.) One that roves about for prey (*Thomson*).

**PROXIMATE.** *a.* (*proximus*, Lat.) Next in the series of ratiocination; near and immediate (*Burnet*).

**PROXIMATE CAUSE.** *Causa proxima.* The proximate cause of a disease may be said to be in reality the disease itself. All proximate causes are either diseased actions of simple fibres, or an altered state of the fluids.

**PROXIMATELY.** *ad.* (from *proximate*.) Immediately; without intervention (*Bentley*).

**PROXIME.** *a.* (*proximus*, Latin.) Next; immediate (*Watts*).

**PROXIMITY.** *s.* (*proximitas*, Lat.) Nearness (*Hayward*).

**PROXY.** *s.* (By contraction from *procuration*.) 1. The agency of another. 2. The substitution of another; the agency of a substitute (*South*). 3. The person substituted or deputed (*L'Estrange*).

**PRUCE.** *s.* Prussian leather (*Dryden*).

**PRUDE.** *s.* (*prude*, Fr.) A woman over-nice and scrupulous, and with false affectation (*Swift*).

**PRUDENCE.** *s.* (*prudence*, French; *prudentia*, Latin.) Wisdom applied to practice (*Hale*).

**PRUDENT.** *a.* (*prudent*, Fr. *prudens*,

Lat.) 1. Practically wise (*Milton*). 2. Fore-seeing by natural instinct (*Milton*).

**PRUDENTIAL.** *a.* (from *prudent*.) Eligible on principles of prudence (*Rogers*).

**PRUDENTIALS.** *s.* Maxims of prudence or practical wisdom (*Watts*).

**PRUDENTIALITY.** *s.* (from *prudential*.) Eligibility on principles of prudence.

**PRUDENTIALLY.** *ad.* (from *prudential*.) According to the rules of prudence (*South*).

**PRUDENTIUS** (Quintus Aurelius), a Spaniard, and christian poet, born in 1348. He was lawyer, judge, and soldier, before he betook himself to poetry, in which he is not greatly admired for his versification. His works were printed at Amsterdam by Daniel Elzevir, in 1667, and again at Paris in 1687.

**PRUDENTLY.** *ad.* (from *prudent*.) Discreetly; judiciously (*Bacon*).

**PRUDERY.** *s.* (from *prude*.) Overmuch nicety in conduct.

**PRU'DISH.** *a.* (from *prude*.) Affectedly grave.

**PRUINOUS**, in natural history, covered with a kind of frosty mealliness.

**PRUNE**, in botany. See **PLUM** and **PRUNUS**.

**TO PRUNE.** *v. a.* 1. To lop; to divest trees of their superfluities (*Davies*). 2. To clear from excrescences; to trim (*Bacon*).

**TO PRUNE.** *v. n.* To dress; to prink. A ludicrous word (*Dryden*).

**PRUNELLA.** Self-heal. In botany, a genus of the class didynamia, order gymnospermia. Filaments forked; one point bearing the anthers on its lip; stigma cloven. Three species—European plants; one, *P. vulgaris*, found wild in our own pastures.

**PRUNELLA** (Sal), in pharmacy, a preparation of purified saltpetre, called also crystal mineral, made in this manner: having melted any quantity of saltpetre, cast a little flower of sulphur upon it, and when that is burnt throw on more; and continue to do so till the nitre flow as clear as rock-water. Then with a clean iron or brass ladle take it out, and, putting it into moulds till coagulated, preserve it for use.

**PRUNELLO.** *s.* 1. A kind of stuff of which the clergymen's gowns are made (*Pope*). 2. A kind of plum (*Ainsworth*).

**PRU'NER.** *s.* (from *prune*.) One that crops trees (*Denham*).

**PRUNIFEROUS.** *a.* (*prunum* and *fero*, Latin.) Plum-bearing.

**PRUNING**, in gardening the operation of lopping from wall-fruit trees their superfluous branches, so that every branch and part of a branch may be fully exposed to the rays of the sun; and the root be neither exhausted by barren shoots, nor have more fruit to supply with nutriment than it can render perfect.

Of this "master work of gardening," it has been said, "that gentlemen prune too little, and gardeners too much;" these extremes are to be avoided, as attended with peculiar evils, equally mischievous: wall-trees are presently spoiled by either practice. If they are too full of wood, the shoots

# PRUNING.

and fruits cannot be properly ripened : and if they are too thin (the greater evil of the two,) the consequence of the cutting that has made them so, is the production of wood rather than fruit ; forcing out shoots, where otherwise blossom-buds would have been formed. The designation of trees to a wall (from the superabundant heat) necessarily occasions cutting, and on the skilful use of the knife much depends.

Every one who has wall-trees cannot keep a professed gardener ; nor is every one who calls himself so qualified to prune. It is a great mortification to a man who wishes to see his trees in order, not to be able to procure an operator to attend them ; let him then resolve to learn the art himself, and the ability will be very gratifying to him.

As many words must be used on this article of pruning, for the sake of order, the business of managing wall-trees may be, 1. Concerning the form. 2. The health. 3. The fruitfulness of them.

1. As to the form, or general appearances of the wall-trees. If a tree is young and newly planted, the first thing is to head it down, by cutting off (if it is a nectarine, peach, or apricot) all the shoots, and the stem itself, down to a few eyes, that the lower part of the wall may be furnished with new and strong wood. Make the cut sloping, and behind the tree, taking care (by placing the foot on the root, and the left hand on the stem) not to disturb the tree by the pull of the knife. Plaster the part with a bit of cow-dung, clay, or stiff earth. It is evident from this that maiden stocks are the best to plant.

The heading down is to be made so as to leave two or three eyes, or four if a high wall, on each side of the stem, from which shoots will come properly placed for training. The number of eyes may be also according to the strength of the tree, and its roots. If there are not two well-placed eyes on each side of the stem, two shoots, thus situated, may be left, cutting them short to two or three eyes each. Eyes or shoots behind or before, consider as of no use, and let them be early displaced by rubbing or cutting. This work is to be performed in spring, when the tree is putting forth shoots ; i.e. about the beginning of April.

If towards the end of May there should be wanting shoots on either side the tree, having perhaps only one put forth where two were expected, this one shoot should be cut, or pinched down, to two or three eyes ; and before summer is over there will be found good shoots from them, and thus a proper head be obtained. This work of shortening shoots of the year may be done any time before midsummer ; but in this case, all ill-placed or superfluous growths must be rubbed off as soon as seen, that those to be reserved may be the stronger, receiving more nourishment.

As the lateral shoots grow, let them be timely nailed to the wall, close, straight, and equidistant, but use no force. If they are quite well placed, they will need no bending ; but sometimes shoots must be laid in which are not perfectly so. Lay in as many good moderate-sized shoots as may be throughout the summer, for choice at winter pruning, yet do not crowd the tree. As the shoots proceed in length, nail them to the wall, that no material dangling of them may be seen ; but avoid using too many shreds.

In the formation of a tree, keep each side as nearly as can be equal in wood ; and the shoots inclining downwards, which is a mode of training necessary to fill the lower part of the wall (none

of which should be lost), and to check the too free motion of the sap, which wall-trees are liable to from their warm situation and continual cutting. All the branches should have an horizontal tendency, though the upper cannot have it so much as the lower ones. Those that are perpendicular, or nearly so, mount the wall too fast, and run away with the food that should pass to the horizontals ; which being impoverished by the vigorous middle branches, gradually become too weak to extend themselves, and nourish the fruit. The pruner, therefore, must be content to have some of the wall, over the middle of the tree, unoccupied ; or, at least, suffer none but weak or very moderate shoots to find a place there.

The idea of a well-formed tree is somewhat represented by the ribs of a spread fan, or the fingers of the hand extended. Regularity is allowed to be so necessary to the beauty of a wall-tree, that some have even drawn lines for a guide to train by ; but nature (ever free and easy) will not submit to so much formality, and such a perfect disposition of the branches is not necessary. A tree may be regular without being linear, and the proper useful shoots are not to be sacrificed to a fanciful precision. Though crossing of branches is against rule, yet cases may happen (as in want of wood or fruit) where even this awkwardness may be permitted. The object is fruit ; and to obtain this end, form must sometimes give place.

All foreright and back shoots, and other useless wood, should be displaced in time, for they exhaust the strength of the tree to no purpose, and occasion a rude appearance. It is a very expeditious method to displace superfluous young shoots, by pushing or breaking them off ; but when they get woody it is apt to tear the bark, and in this case the knife must be used : the better way is to disbud by rubbing ; yet a young luxuriant tree should be suffered to grow a little wild to spend the sap. There is one evil, however, attending on disbudding, and rubbing off young forerights, that some fruit spurs are thus lost ; for apricots are apt to bear on little short shoots of from half an inch to an inch (or more), and there are peaches which do the same ; so that it is a rule with some pruners to wait to distinguish spurs from shoots, and then to use the knife, yet use it as little as may be in summer.

In regulating a tree at any time, begin at the bottom and middle, and work the way orderly upward and outward. Never shorten in summer (which would produce fresh shoots), except a forward shoot where wood may be wanting ; but where the tree is really too thick, cut clean out what may be spared. None of the shoots produced after midsummer should be nailed in, except where wood is wanting to fill a naked place. They never bear fruit.

2. The health of wall-trees is greatly provided for by observing the directions already given concerning their form ; for if observed, each shoot will have the proper benefit of sun and air, to concoct its juices and prepare it for fruiting.

It injures a tender shoot when it presses hard against a nail. If the hammer strikes a shoot, and bruises the bark, it often spoils if not kills it, by the part cankering. The shreds may be too tight, so that the shoot cannot properly swell ; and if shreds are too broad and too numerous, they are apt to occasion sickness, and prove a harbour for insects and filth : let the number be lessened at all opportunities. A slip of the knife may wound a neighbouring branch, and make it gum,



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canker, or die. It will require care, and some practice, to avoid this accident; and in order to it, keep the point of the knife sharp, and mind the position of it when cutting. Cut close and sloping behind the eye; neither so near as to injure it, nor so wide as to leave a stub.

The bending of a branch much is a violence to be avoided; so that every shoot should be kept from the first in the direction it is to grow in.

Luxuriant wood must be particularly attended to, to get rid of it in time, before it has robbed the weaker branches too much. That is luxuriant wood which, according to the general habit of the tree, is much larger than the rest; for a shoot that is deemed luxuriant in one tree may not be so in another. If strong wood, that is not very luxuriant, happens to be at the bottom of the tree, so that it can be trained quite horizontally, it may often be used to good purpose, as this position checks the sap. A luxuriant shoot may be kept in summer where it is not designed to retain it, merely to cut it down at winter-pruning to two or three eyes, for getting wood where wanted the next year; or this shortening may take place in June, to have new shoots the present year. Luxuriant shoots may be sometimes retained for a time, merely as waste pipes.

All diseased, damaged, very weak, or worn out branches (as they occur), should be cut out, to make way for better; but if a tree is generally diseased, some caution must be used not to cut out too much at once, if there is any hope of restoring it. A very old tree, or a young one that does not thrive, may be cut a great deal; but prune it so as to have a general sprinkling of the best of the branches, and keep short lengths of an eye or two of the weaker ones, in a sort of alternate order.

Young trees are very apt to decline, and sometimes die, if suffered to overbear themselves the first year or two of fruiting. The remedy is obvious, and should resolutely be applied.

A weak tree is helped much by training it more erectly than usual, as less check is thus given to the sap, and so the shoots are more likely to swell: such a tree should be kept thin of branches, and always pruned early in autumn, keeping the top free from such wood as is stronger than that which is in general below, and all the shoots shorter than usual.

Old decaying trees should be lessened a little every year, and constantly watched, to observe where young and strong shoots are putting out below, in order to cut down to them; and though the time for doing this is commonly at autumn or winter pruning, yet it may be best done in summer, as the shoots would thrive the better; observing to put some grafting-clay or cow-dung to the part, to prevent gumming, which summer pruning is apt to occasion. A judicious pruner may bring the oldest and most ill-conditioned tree to a healthy and bearing state if all is but right at the root, in having a good soil about it.

Keep all wall-trees clean, and particularly weak ones, from moss, cobwebs, or other filth; and attend to insects, snails, caterpillars, and smother flies. Any bark that is decayed by cracks, &c. must be cleared away to the quick, either by rubbing, or the knife, as filth and insects are apt particularly to gather there: wipe the part clean with sponge and soap.

Consider the soil about an unthrifty tree, and if it is thought bad, improve it by moving away

as much of the old as conveniently can be done. The roots may be laid carefully quite bare, and examined, in order to cut off decayed or cankered parts, and to apply immediately to them some fine and good fresh earth, with a little thorough-rotten dung in it, and a sprinkling of soot or wood ashes. Hog-dung applied fresh is said to have a peculiar efficacy in recovering weak trees; and cow-dung may reasonably be expected to do good if the soil is a warm or hungry one; and if not so, the hog-dung is not so proper, as it is a cold dressing. If the soil is a strong one, a compost of fowl's or sheep's dung, lime, with any fresh light earth, (one part of each of the former, and three of the latter, mixed with the soil that is taken off,) will be a proper manure, to which a little sharp sand may be added. All these applications should be made late in autumn, or early in spring.

The constitution of a tree is sometimes naturally barren; or the soil that the roots have got into may be so deleterious that no pains or perseverance will avail any thing; but continuing fruitless and sickly, admonishes the owner to take it up and try another plant, rectifying the soil thoroughly if the evil is thought to arise there. The smother-fly sometimes repeatedly attacks the same tree, which is a sign of inherent weakness, for the juices of a sickly tree are sweeter than those of a sound one, and so more liable to such attacks. Sometimes a tree of this kind, when removed to a good soil, and pruned greatly down, does very well. A soil too rich of dung often occasions trees to be blighted, and the remedy is to impoverish it with a sharp sand.

In order to health and strength, a tree must not be kept too full during summer, as it prevents the proper ripening of the wood, and makes the shoots long-jointed. If more than one shoot proceeds from the same eye, reserve only the strongest and best-situated. A crowded tree cannot be healthy, and it becomes both lodging and food for insects. The blossom-buds of a tree being always formed the year before, they will be few and weak in a thicket of leaves, as debared of the necessary sun and air; but in order to avoid an over-fullness, do not make any great amputations in summer.

In clearing a tree of superabundant wood, take care not to cut off the leading shoot of a branch. All shoots after midsummer should be displaced as they arise, except where wanted to fill up a vacancy. In a too vigorous tree, the midsummer shoots may be left for a while on those branches that are to be cut out at winter pruning, as cutting such trees in summer is to be avoided as much as possible; so that a little rudeness in a luxuriant tree may be permitted as a necessary evil, provided it becomes not too shady or unsightly. Watering wall trees with an engine smartly on a summer's evening is conducive to their health, and frees them from insects.

3. The fruitfulness of wall-trees (the ultimate object of planting and training them) comes now to be spoken of. Their proper form and health being good, the foundation is laid, but several things are yet to be done to obtain the end proposed; and this chiefly regards the principal cutting, or what is called winter or spring pruning.

If trees have been planted far enough asunder, it is a happy circumstance, as the proper horizontal form, and the open middle, may be preserved. The longer the horizontals are, the more necessary it is to be careful to suffer none but weak branches in the centre uprightly. If trees are

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confined as to length of wall, they of course take a more erect form, but still strong wood should not mount just in the middle.

A tree is to be thinned of damaged, unpromising, and ill-placed shoots, and of woody branches that are decaying or reach far without fruitful shoots on them, and always some of the old wood should be cut out where there is young to follow or supply its place. Of the fair and well-placed shoots also, the superabundance is to be taken away, so as generally to leave the good ones at four, five, or six inches asunder, according to the size of the wood and fruit.

Luxuriant wood, *i. e.* those shoots that are gigantic, must be taken out from the rest, as they would impoverish the good, and destroy the weak branches, and are never fruitful; but if a tree is generally luxuriant it must be borne with; and the less it is cut, comparatively speaking, the better. Such a tree, after a few years, may come to bear well; and when it begins to shoot moderately, some of the largest wood may be taken out each year, or shortened down to two or three eyes, and so brought into order. The more horizontally free-shooting trees are trained, the better, as the bending of the shoots checks the sap.

As the pruner is to begin below, and towards the stem, so the object in thinning must be to prefer and to leave those shoots that are placed lowest on the branches, that so the tree may be furnished towards the centre. See that those left are sound, and not too weak or over-strong, for the moderate shoots generally bear best. Weak shoots are always more fruitful than strong ones; and if they are furnished with fair blossoms, should be kept where a tree is full of wood, and even preferred to moderate ones on a very flourishing tree.

The next object is, to furnish a tree. In order to this, the thinning of old wood, young being ready (or easily to be procured) to follow, has already been mentioned; but the principal step is the shortening of the shoots, which occasions them to throw out below the cut, for future use. If they were not to be shortened, the tree would presently extend a great way, bearing chiefly at the extremities; and all over the middle it would be very thin of fruit, and thus a great part of the wall lost.

The mode of bearing in peaches, nectarines, and apricots, is on the last year's wood; which makes it necessary to shorten, in order to a certain supply of shoots for bearing the next year, and thus to have succession-wood in every part of the tree.

The rule for shortening is this: Consider the strength of the tree; and the more vigorous the shoots are, cut off the less. If a luxuriant tree was to have its shoots much shortened, it would throw out nothing but wood; and if a weak tree was not pretty much cut, it would not have strength to bear. From vigorous shoots one-fourth may be cut off; from middling ones one-third; and from weak ones one-half.

In shortening, make the cut at a leading shoot-bud, which is known by having a blossom-bud on the side of it, or, which is better, one on each side. Blossom-buds are rounder and fuller than leaf-buds, and are discernible even at the fall of the leaf, and plainly seen early in the spring. It is desirable to make the cut at twin blossoms, yet as this cannot always be done, the due proportion of length must generally determine. It often happens, that the blossom-buds are chiefly, and sometimes all, at the end of the shoot; but still it should

be shortened if it is at all long. Never cut where there is only a blossom-bud; and prefer those shoots that are shortest-jointed, and have the blossoms most in the middle. The shoots that lie well and are fruitful or healthy, and but a few inches long, may be left whole. Always contrive to have a good leader at the end of every principal branch.

Young trees (as of the first year of branching) should have the lower shoots left longer in proportion, and the upper shorter, in order to form the tree better to the filling of the wall: the lower shoots may have three or four eyes more than the upper.

In furnishing a tree, consider where it wants wood, and cut the nearest unbearing branch (or if necessary, a bearing one) down to one, two, or more eyes, according to the number of shoots desired, for in such close shortening, a shoot will come from each eye. With a view to wood for filling up a naked place, a shoot formed after midsummer may be thus shortened; though the general rule is, to displace all such late shoots as useless, the dependence for blossoms being on the early-formed shoots.

The time for the principal, or winter pruning, is by some gardeners held indifferent, if the weather is mild at the time; but a moderate winter's day is often quickly followed by a severe frost, which may hurt the eye and blossom next the cut. The best time is February, if it is mild, or as soon after as possible; for when the blossom-buds get swelled, they are apt to be knocked off by a little touch or jar of the hammer.

Apricots should not be so much shortened as peaches, nor do they so well endure the knife. Shoots of the apricot, if under a foot, may be left uncut, if there is room. The spurs of apricots should be spared, if not too long or numerous, for they bear well, and continue for years. Some sorts of peaches are also apt to put out fruit-spurs, and must be managed accordingly.

Vines require frequent attention, as to pruning and training; but all will avail little if they have not a warm soil and full sun, or some accidental advantage, as being planted at the back of a warm chimney; and though they will grow and bear leaves any where, they will not fruit well in England without a favourable season, or hot summer.

Young new-planted vines should be pruned quite short for two or three years, that they may get strong. If the plant has a weak root, not above one shoot ought to grow the first year, which should be cut down in autumn, or to two or three eyes.

The best time for the principal, or winter pruning of vines, is as soon as the fruit is off, or the leaves falling. November does very well, and if this month passes, February should be adopted rather than quite in the winter. Late in the spring they are apt to bleed by cutting, which greatly weakens them.

The mode of bearing in vines is only on shoots of the present year, proceeding from year-old wood. The rule, therefore, at winter pruning is, to reserve those shoots of the year that are best situated as to room, for training of those shoots that are to come from them, which will be almost one from every eye. Make choice of those that are placed most towards the middle, or stem of the vine, that all the wall may be covered with bearing wood; and every year cut some old wood



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out that reaches far, to make room for younger to follow.

The shortening of the shoots should be according to their strength, and the space there is for training those shoots that will be produced, which always grow very long. If there is room, three, four, or five eyes may be left; but not more to any shoot, except it is desirable to extend some shoot to a distance to fill up a particular space: and then eight or nine eyes may be left, which being repeated again another year, and so on, a vine will soon reach far.

Sometimes vines are trained on low walls by a long-extended horizontal branch, a few inches from the ground, as a mother-bearer. Those shoots that come from this horizontal are to be trained perpendicularly, and cut down to one or two eyes every year, that they may not encroach too fast on the space above them. If the vine is confined to a narrow but lofty space, it is to be trained to an extended perpendicular mother-bearer, having short lateral shoots pruned down to a single eye, or at most two. The management of vines requires severe cutting, that they may not be too full in the summer, for they put out a great deal of wood, and extend their shoots to a great length; and therefore the young pruner must resolve to cut out enough.

An alternate mode of pruning vines is practised by some, one shoot short, and another long, *i. e.* one with two eyes, and another with four or five. Severe cutting does not hurt vines, and make them unfruitful, as it does other trees; and therefore, where short of room, they may be pruned down to a single bud, as the case requires.

The summer management of vines must be carefully attended to. As soon as the young shoots can be nailed to the wall, let them not be neglected; but remember they are very tender, and will not bear much bending: train in only the well-placed shoots, rubbing or breaking off the others. The embryo fruit is soon seen in the bosom of the shoot; and those thus furnished are of course to be laid in, as many as can be found room for, in preference to those shoots that are barren; which nevertheless should also be trained, if they are strong and well placed, and there is space for them. Rub off all shoots from old wood, except any tolerable one that proceeds from a part where wood is wanting to fill up some vacant space. If two shoots proceed from one eye, displace the weakest, or the outermost if they are both alike, and the fruit should not direct otherwise. Vines grow rapidly; and must be nailed to the wall, from time to time, as they proceed, that there may be no rude dangling, which would not only have a slovenly appearance, but in several respects be injurious.

The stopping of the shoots is to take place, both as to time and measure, according to the strength and situation of them, or whether fruitful or barren. Those weak shoots that have fruit, and are rather ill placed, or confined for room, may be stopped at the second, or even first, joint above the fruit, early in the summer; but those shoots that are strong and have room to grow should not be stopped till they are in flower (in July), and at the third or fourth joint above the fruit. In shortening the shoots of the vine, do it about half an inch above an eye, sloping behind a plump and sound one. The barren shoots are to be trained at full length, and not stopped at all if there is room for them, or, at least, but a little shortened towards autumn, as in August, because they would

put out a number of useless and strong side-shoots if cut before.

The side-shoots, *i. e.* those little ones put out by the eyes that are formed for next year, are commonly directed to be immediately displaced by rubbing off, as soon as they appear; and if the vine is large, and the shoots slender, it is very proper; but if otherwise, their being left to grow awhile (so as not to get too rude and crowding) is rather an advantage, in detaining the sap from pushing the shoots out immoderately long; and when these are taken off, the lower eye of each may be left with the same view. But the side shoot that proceeds from the top of each shortened branch should be left on, and when it gets long, then shortened down to an eye or two.

In order to fruitfulness, vines will need dressing with some sort of manure; for though they grow in vineyard countries on rocky hills, and in very shallow soils, and have done so on some chalky, hot, gravelly hills in England, yet some warm manure they must generally have applied, or they will produce little good fruit.

Some people are very fond of exposing the fruit of the vine to the full sun, by stripping off leaves; but this should not be practised till the bunches have attained their proper size, needing only to be ripened, and even then but little should be done in this way. The loss of leaves is an injury to every plant, as it prevents the elaborating of the saccharine juices necessary to perfect the fruit.

Fig-trees are best pruned early in spring, as after an autumn cutting (if late) they are apt to die down. The mode of bearing in the fig is, that fruit chiefly comes the present year on the little shoots from wood of the preceding, and that towards the ends of the branches, which circumstances dictate the rules for pruning. Two-years-old wood will bear some, but older wood never.

The shoots, during summer, are to be laid in at full length, plentifully, as room will permit. The weak, ill-placed, or superabundant ones, cut clean out; yet rather break, or rub them off, in an early state of growth, for cutting branches or shoots in summer is apt to make them bleed as it is called, *i. e.* the sap run; when cut in autumn, the fig will sometimes bleed for a day, but if late-cut in spring, the oozing will continue perhaps a week.

At the principal pruning, the strongest and the closest-jointed shoots are to be preferred, and left about seven or eight inches asunder, without shortening. Let the spare shoots be cut out close and smooth, and as much of the old wood as may be: for the tree will increase too fast, and get too naked of bearing wood in the middle, if this is not freely done; and the essential point in the management of the fig-tree is (as indeed of all wall-trees) to have young wood all over it, and particularly in the middle, and towards the bottom. Wood is seldom wanted in a fig-tree; but where it is, the shortening of a shoot, properly situated (by taking off the leading bud, or cutting lower, as the case requires), is sure to produce it. Do this in April, as the best time.

When hard frosts are expected, strew some ashes and some litter over the roots of fig-trees. Mats should be nailed over their branches (first pulling off the figs), as the succulent nature of their wood makes them tender. These coverings are to remain till the frosts are judged to be over, and then let them be covered up at night, and not

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by day, for a week or two, to harden them by degrees.

But fig-trees will mostly survive hard winters when in standards, without covering; and though shoots trained to a wall are tenderer, yet pea-baulm hung close among the branches (at the approach of sharp frosts) will preserve them. This sort of protection, as affording plenty of air, is by many good gardeners preferred to the more common practice of matting. But if mats were contrived to roll up and down, or kept a little distance from the tree, so as to give more or less air as the weather is, the health and fruitfulness of the tree would be better ensured, for too close (and, as it commonly happens in consequence, too long) covering is injurious to both. Fig-trees that have been close covered are often hurt by an early uncovering, and yet the spring air, as soon as possible, is desirable.

Pears being planted against a wall in autumn, should not be cut down till spring, when the head is to be reduced according to the goodness of the root, and so as to lay a proper foundation for covering the wall.

The mode of bearing in pear-trees is on short spurs, which appear first towards the ends, and then form themselves all along the branches, which do not produce blossoms for three or four years from planting, and sometimes (according to the sort, or perhaps soil) for several years more. When they are come to fruiting, some pears bear pretty much on year-old wood, some on two, others on three. The same branches continue to bear on spurs from year to year, and most when five or six years old; but as in course of time the branches may become diseased and barren, and not produce so fine fruit as younger wood, it is always proper to procure a succession of young bearers, as the opportunity of good shoots offer, cutting out old wood.

The time for general or winter pruning of pear-trees ought to be November, as the blossoms are then very discernible, and at spring pruning they get so turgid and tender, that almost the least touch knocks them off, or even the jarring of the tree.

Apples are sometimes planted against walls, and what has been said of pruning and managing pears is applicable to them; the branches, however, may be laid in somewhat closer, as they will not require so much room; yet they ought to have from twenty-five feet in length of a low wall, or on a high one something less.

Mulberries require good room, as their mode of bearing is mostly at the end of the trained shoots, which are therefore not to be shortened. Twenty or twenty-five feet should be allowed them, and a new-planted tree is to be headed down as directed for pears, &c. A succession of new wood must be always coming forward, and of course some old taken out, for the fruit is produced chiefly on year and two-year old wood; and as it comes on spurs, and also small shoots of the same year, the leaving short stubs (of moderate wood) in pruning, seems justified, though by some condemned.

Cherry-trees, if against a wall, should be trained at length, four or five inches asunder. The fruit comes from spurs all along the shoots, on one and two years old wood, which will continue to bear. In pruning, have an eye, however, to some fair shoots for successors to those that are getting diseased, or worn out. Some cut all superfluous shoots clean away, and others leave a sprinkling

of short stubs, which may be allowed; but let them not advance far foreright.

Plums of the finer sorts are often planted against walls, and deserve a good one. For the pruning of plum-trees, the directions given for cherries apply to them, only that the branches should be laid somewhat wider, *i. e.* at five or six inches, according to the sort, as free or less free in their growth.

Currants and gooseberries bear fruit upon young wood, and on little spurs of the old. Superfluous shoots are to be cut down to little stubs or spurs, about half an inch long, which will throw out fruit-shoots and spurs. The mother-branches of currants and gooseberries will last many years; but when good young wood can be brought in for principals, a renewal every three or four years is necessary to produce fine fruit.

The work of pruning espalier-trees is much the same as for wall-trees.

As trees planted for espalier training should be young, let great care be taken to set them off right at first, by regular shoots, full furnished immediately from the stem, which is effected by proper heading down. Apples, pears, plums, cherries, &c. in general, need not to be so much freed of all branches at planting, as peaches, nectarines, and apricots. There are, however, gardeners who prune down to the stem all sorts of wall and espalier trees, as peaches are.

The principle of pruning standard trees is the same, whether full, half, or dwarf standards; and the object is, to form a compact handsome round and open head, rather small than large, equal on all sides, with tolerably erect wood, capable (as far as the art of the pruner can go) of supporting the fruit without much bending. Perfect symmetry indeed is not necessary: but confusion of branches, weak and crossing, crowded and dangling, is to be prevented by pruning; for a proper use of the knife is capable of doing much towards the beauty and fruitfulness of standard trees. A little pruning of standards every year, and a general one every three or four years, to cut out what is decayed, and some of the older wood where a successful supply of young may be obtained to succeed, is the way to keep them in vigour, and have the best of fruit; for that which grows on old wood gets small and austere. To take off large branches, a thin broad chisel is proper; but if a saw is used, smooth the part with a knife.

Clear trees from moss, by scraping them with a long narrow-bladed blunt knife, on a bit of hard wood; and cut or rub off bits of decayed bark, in which insects are apt to breed, and wipe the part clean. Some use a scouring-brush, the long end-hairs of which are well adapted to clean the fork parts. A bit of hair cloth is also used for the purpose; and a finish is properly made to do the business well, with a brush and soap and water.

*Of pruning shrubs.*—Many shrubs are cultivated for their ornament, and some for their fruit; of the latter kind are raspberries and barberries.

Raspberries bear fruit on little side shoots of the present year, proceeding from stems of the last, and sometimes produce a little on those of the same year. To prune or dress the shrub, therefore, first cut out all the old bearers, whose wood dies; then cut out, close to the stool, all the new shoots, except three or four of the strongest, which may be carefully twisted from the bottom upwards, or tied together at the top, or if upright and strong, left to support themselves singly.



The barberry is a beautiful and somewhat large shrub, which should be suffered to grow with a full head, like a dwarf standard tree. It bears along the sides of both young and old wood, but chiefly towards the ends, and its branches should therefore not be shortened, except with a view to throw out wood. Keep the root free from suckers, and the stem from shoots in its lower part, and prune out weak, luxuriant, straggling, and crossing branches, forming it to a somewhat round head, which keep moderately open. Let the stem be freed from lower branches to the height of three, four, or five feet, according as the shrub may be desired to approach to a tree.

Flowering shrubs are of great variety, and the method of pruning them is to be determined according to the several modes of bearing, of which consider chiefly these; that is, whether they produce their flowers upon the last year's shoots or the present, on the ends or the sides of their branches. If a shrub bears on the last year's shoots, it is evident that it must be cut away no more than is necessary to keep it within bounds, open and handsome as to its form; in this case it is the business to cut clean out, or very low, what is to be spared. If a shrub bears on the present year's shoots, the old wood may and must be cut down freely, so however as to leave eyes enough for new shoots to proceed from, to make a sufficient head and show. If the shrub bears altogether or chiefly at its ends, no shortening must take place: but if some of the branches are too long, they may be either cut out, or quite low, leaving the shorter ones to bear. If the shrub bears along its sides, the shortening is of no consequence, and the desired form may be freely provided for at pleasure.

The season for pruning shrubs is generally the spring; but autumn is better, if not too near winter, as at this time sharp weather might occasion some of the sorts (as jasmines and honeysuckles) to die down. The time of flowering must in some measure direct the time of pruning. Shrubs that flower in winter (as the laurustinus) should be cut in spring. Those that flower in spring may be pruned immediately after their blow, or in summer. Those that flower in summer should be pruned in autumn; and those that flower in autumn should be pruned either soon after flowering, or in spring.

Be sure to take off in time, *i. e.* as soon as discovered, all suckers and over-strong shoots from shrubs; for by their luxuriancy they greatly impoverish the proper-sized branches, which are the fruitful ones, and such large sappy wood looks very unsightly.

The height of shrubs in certain situations is material, and to provide for this, the art of pruning is in a great measure competent. To keep them low, cutting down is of course necessary; but it will be well also to make the soil poor if too rich. To encourage them to mount, keep trimming off close the lower branches, and improve the ground by digging and dressing occasionally.

Roses bear upon shoots of the present year, and upon those formed after midsummer in the past year, but chiefly upon the former. Therefore they may, or rather should, be cut down low, leaving only three or four eyes to a shoot; except some of those short shoots formed the last year too late to blow then, leave whole. If rose-trees are not close pruned, they will be unable to support their flowers properly. Use a sharp knife, and cut close behind an eye or bud. Roses for forcing should be pruned in July and August.

Honeysuckles flower on shoots of the present year, and therefore whether trained to walls, or kept in bushes, should be also pruned close; but not so short in the latter case as the former, for those against walls should be cut down to an eye or two, and those in bushes to three or four eyes.

Sweetbriars flower on shoots of the present year, and therefore should be cut after the manner of honeysuckles. These shrubs (and most others) are seldom pruned down enough, so that in a few years they get very rambling and unsightly; but if kept compact, we have beauty as well as sweetness, to recompense our care. In all cases, a less number of fine flowers obtained by short and open pruning, is certainly preferable to many indifferent ones.

Lilacs bear their flowers at the ends of shoots of the last year, so of course at spring must not be shortened. If rambling and crowded, cut either clean out, or very low, what may be superfluous. If they need much reduction, let them be cut down as soon as (or somewhat before) they have got off flower.

To enter farther into the detail of shrubs would be inconsistent with our limits. The reader will find some directions occasionally under the separate articles, and will commonly act safely under the general directions above.

**PRUNINGHOOK. PRUNINGKNIFE. s.**  
A hook or knife used in lopping trees.

**PRUNUS.** Plum-tree. In botany, a genus of the class icosandria, order monogynia. Calyx inferior, five-cleft; petals five; drupe with a stone marked with slightly prominent seams. Thirty-one species; natives of Europe, Asia and America, six of our own country.

The following are the cultivated species:

1. *P. domestica.* Common plum-tree. This grows wild in our hedges with peduncles, mostly solitary: leaves lance-ovate, convolute when young, and unarmed branches, and gives birth to all the rich variety of our cultivated garden and orchard plum-trees, of which there are some hundreds.

2. *P. insititia.* Bullace-tree. Peduncles in pairs; leaves lance-ovate, convolute when young, villous underneath; branches ending in a spine. This also is common to our hedges; from twelve to fifteen feet high. It varies with black and white, or rather wax-coloured fruit; and also with a red, bitter, unpleasant fruit.

3. *P. spinosa.* Black-thorn. Sloe-tree. Peduncles solitary; leaves elliptic, lanceolate, pubescent underneath; fruit straight; branches spinous. Found also in our hedges and woods; and often very usefully employed in the formation of hedges.

Three sorts of plums, from the almost infinite variety of the plum-family, are ranked among the articles of the materia medica; they are all met with in the gardens of the country, but the shops are supplied with them moderately dried, from abroad. 1. The *pruna brig-nolensia*; the Brignole plum, or prune, brought from Brignole in Provence; it is of a reddish yellow colour, and has a very grateful, sweet, subacid taste. 2. The *pruna gallica*, the common or French prune. The *pruna damascena*, or damson. (See DAMSON.) All these fruits possess the same general qualities

## PRUNUS.

as the other summer fruits. The prunelloes, in which the sweetness has a greater mixture of acidity than in the other sorts, are used as mild refrigerants in fevers and other hot indispositions. The French prunes and damsons are the most emollient and laxative; they are often taken by themselves to gently move the belly, where there is a tendency to inflammations. Decoctions of them afford a useful basis for laxative or purgative mixtures, and the pulp in substance for electuaries.

4. *P. Armeniaca*. Apricot. Flowers sessile; leaves somewhat hearted. It is a native of the Levant; and in cultivation yields a great multitude of varieties.

5. *P. cerasus*. Common cherry-tree. Umbels nearly sessile; leaves ovate-lanceolate, folded when young. An elegant as well as a most useful fruit-tree. It differs from the plum in having the stone nearly globular, with the kernel of the same shape. A native of Asia and Europe. Its varieties are too numerous to be detailed.

6. *P. avium*. Small-fruited cherry-tree. In some counties called merries. It often grows to a large sized tree, and is found wild in our own woods. It has two or three varieties.

7. *P. padus*. Common bird cherry-tree. Found also in our woods; rising to the height of ten or twelve feet, with a trunk of nine or ten inches in diameter. Sometimes called the cluster cherry-tree.

8. *P. rubra*. Cornish bird cherry-tree. More than twenty feet high, with branches shorter and closer than in the last; fruit larger, and red when ripe. It is found wild in Armenia.

9. *P. Virginiana*. Common American bird cherry-tree. Rises with a thick stem from ten to thirty feet high, dividing into many branches, with a dark purple bark. Fruit larger than in the preceding, black when ripe, and greedily devoured by birds. Wood beautifully veined with black and white, and bears a good polish. A native of Virginia and other parts of North America.

10. *P. Canadensis*. Canadian bird cherry-tree. Branches even; leaves slightly serrate, green on both sides. A native of North America.

11. *P. mahaleb*. Perfumed cherry-tree. A low, crooked tree; wood red, hard, sweet-scented; fruit black, yielding a bitter purple juice that stains, without being easily removed. A native of Austria. In Ray it is called rock-cherry.

12. *P. Caroliniana*. Ever-green bird cherry. Shrubby; not more than three feet high, with lateral branches, spreading on every side covered with a brown bark. A native of South Carolina.

13. *P. lauro-cerasus*. Common laurel. A wide-spreading shrub, with a smooth brown bark; flowers racemed, calyx ovate, petals white; filaments about eighteen; leaves ever-green, with two glands on the back above the petioles; fruit resembling a black cherry both

in its external and internal structure. A native of the Levant; flowers in April.

14. *P. Lusitanica*. Portugal laurel. Stem arborescent, rising upwards of twenty feet, branchy, with a shining purplish bark; leaves evergreen, bright; flowers in long bunches from the sides of the branches, white in colour; berries oval, pulpy, at first green, then red, and when ripe very dark purple; smaller than those of the last sort, and narrower at the end: flowers in June; and is one of the most beautiful evergreen shrubs we possess. A native of Portugal.

Plums are all propagated by budding or grafting upon stocks of the stoutest wild sorts. Budding answers best, as the incision is apt to throw forth a great deal of gum: the tree should be no more than one year's growth from the bud when transplanted; if beyond this it will be subject to canker, or at least produce only two or three luxuriant branches. If the tree be meant for walls, the whole management of planting and pruning will be the same as that for peaches.

Should the walls against which they are to be planted below, they must be placed thirty feet asunder, but if high, twenty feet will be sufficient, with an east or south-east aspect: the soil should be midway between one very moist and very dry.

Plums, with proper care, succeed very well as espaliers or standards, but the fruit will not be so rich. It is a common error to be too free with the knife in winter pruning, in which the extremities of all the branches are cut off; the consequence of this is, that there is a surplus of young shoots produced, and the fruit becomes small and impoverished.

Of the apricot there are several varieties which may be propagated by budding on plum-stocks. These trees may also be planted in October, against walls with an east or west aspect, in borders of fresh earth, from a pasture-ground; they may stand at the distances directed in the culture of the plum, and let the ground round the roots be covered with rotten dung, to keep out the frost. About the beginning of March you must cut off the head of the tree, and shorten it to about four or five eyes above the bud, so that the sloping side may be towards the wall, taking care not to disturb the root. In spring, if the weather be dry, the trees must be gently refreshed with water, and some turf or other mulch should be laid round their roots. Let the new branches be nailed to the wall in an horizontal position, and such shoots as are produced fore-right must be entirely displaced; at Michaelmas unnailed the branches, and shorten them in proportion to their strength; after which nail them as horizontally as possible. The second and third year the trees may have nearly the same management.

There are several varieties of the cherry-tree usually cultivated in fruit-gardens. They are all propagated by binding or grafting the several kinds into stocks of the black or wild red cherries, which are strong shooters, and of a longer duration than any of the garden kinds.



The stones of these two kinds are sown in a bed of light sandy earth in autumn, and the young stocks produced from them are to remain where they rise till the second autumn after their sowing, when in October they should be planted out into a rich earth, at three feet distance from row to row, and at about ten inches distance in the rows. The second year after the planting out, they will be fit to bud, if they are intended for dwarfs, but if they are intended for standards, they will not be tall enough till the fourth year; for they should be budded or grafted near six feet from the ground. The grafting is usually performed in summer, and the head of the stock is to be cut off in the beginning of the March following, about six inches above the bud; and if the bud has shot well, and there is any fear of its being displaced by winds, it must be gently tied up to the part of the stock left above it. The autumn afterwards these trees will be fit to remove, and be set where they are to remain; or they may be left two years. Many, when they plant these trees in their places, lop off a great part of their heads, but this is an injury that often kills them; and when they escape, they seldom get well over it for four or five years. If the trees are intended for walls, it is advisable to plant dwarfs between the standards, that these may cover the lower part of the wall, while the others spread over the upper part; and when the dwarfs rise to fill the whole walls, the standards should be taken entirely away. When these trees are taken up from the nursery, the dead fibres of the roots must be carefully taken off, and the upper part of the stock which is above the bud, must be cut off close down to the back part of it: the bud must be placed directly from the wall. Cherry-trees thrive best on a dry hazly loam, and in a gravelly soil are very subject to blights, and seldom stand long good. They should be placed at fourteen feet asunder, with a standard tree between each two. In pruning these trees, their shoots should never be shortened, for they mostly produce their fruit from their extreme part. All the fore-right shoots are to be displaced, and the others trained horizontally; and where there is a vacancy in the wall, the branches being shortened, will throw up a shoot or two to fill it.

Of the cherry-laurel there are several sorts cultivated in the gardens about London: they are all propagated by sowing the berries, or by laying down the tender branches, which will take root in one year's time, and may then be transplanted into beds for a year or two, or even placed at once where they are to remain. If they are to be raised by sowing, the berries must be gathered when ripe, which is in January, and kept in dry sand till the beginning of March, when they must be sown in a bed of rich dry earth, well sheltered from the north and east winds. The bed must be levelled, and then furrows of an inch deep made along it, at eight inches distance; into these the berries are to be dropped about two inches asunder, and covered with earth; and if the season prove

very dry they must be watered: they will come up in about two months, and should be suffered to remain in these beds two years. They should then be transplanted into a bed of earth well dug, and set at eighteen inches asunder; this should be done in April, and they should be well watered, and the ground covered with some muck about their roots. They must be trained up straight, by tying them to stakes, and their under shoots pruned off, to make them advance in height. These trees are proper to plant on the warm sides of hills, where they may be sheltered from the north and north-east winds. In open situations the laurel-tree will sometimes indeed lose all its verdure in severe winters, and appear dead, and many trees have on this occasion been dug up and burnt; but this is a rash and very wrong practice; for usually, if they are suffered to remain they shoot freely again, and after another season are found as lively as ever.

**PRURIENCE. PRURIENCY.** *s.* (from *prurio*, Latin.) An itching or a great desire or appetite to any thing (*Swift*).

**PRURIENT.** *a.* (*pruriens*, Latin.) Itching.

**PRURIGINOUS.** *a.* (*prurio*, Latin.) Tending to an itch.

**PRURIGO.** (from *prurio*, to itch.) The prurigo is a genus of disease in the order papulous eruptions of Dr. Willan's cutaneous diseases. As it arises from different causes, or at different periods of life, and exhibits some varieties in its form, he describes it under the titles of prurigo mitis, prurigo formicans, and prurigo senilis. In these the whole surface of the skin is usually affected; but there are likewise many cases of local prurigo, which will be afterwards noticed according to their respective situations.

1. The prurigo mitis originates without any previous indisposition, generally in spring, or the beginning of summer. It is characterized by soft and smooth elevations of the cuticle, somewhat larger than the papulæ of the lichen, from which they also differ by retaining the usual colour of the skin; for they seldom appear red, or much inflamed, except from violent friction. They are not, as in the other case, accompanied with tingling, but with a sense of itching almost incessant. This is, however, felt more particularly on undressing, and often prevents rest for some hours after getting into a bed. When the tops of the papulæ are removed by rubbing or scratching, a clear fluid oozes out from them, and gradually concretes into thin black scabs.

This species of prurigo mostly affects young persons, and its cause may, we think, in general be referred to sordes collected on the skin, producing some degree of irritation, and also preventing the free discharge of the cutaneous exhalations; the bad consequences of which must necessarily be felt at that season of the year when perspiration is most copious. Those who have originally a delicate or irritable skin must likewise in the same circumstances, be the greatest sufferers.

## P R U R I G O.

The eruption extends to the arms, breast, back, and thighs, and often continues during two or three months of the summer, if not relieved by proper treatment. When persons affected with it neglect washing the skin, or are uncleanly in their apparel, the irruption grows more inveterate, and at length changing its form, often terminates in the itch. Pustules arise among the papulæ, some filled with lymph, others with pus. The *acarus scarabiei* begins to breed in the furrows of the cuticle, and the disorder becomes contagious.

2. *P. formicans*. This is a much more obstinate and troublesome disease than the foregoing. It usually affects persons of adult age, commencing at all seasons of the year indifferently; and its duration is from four months to two or three years, with occasional short intermissions. The papulæ are sometimes larger, sometimes more obscure, than in the preceding species; but are, under every form, attended with an incessant, almost intolerable itching. They are diffused over the whole body, except the face, feet, and palms of the hands; they appear, however, in greatest number on those parts which, from the ordinary mode of dress, are subjected to tight ligatures; as about the neck, loins, and thighs.

The itching is complicated with other sensations, which are variously described by patients. They sometimes feel as if small insects were creeping on the skin; sometimes as if stung all over by ants; sometimes as if hot needles were piercing the skin in divers places. On standing before a fire, or undressing, and more particularly on getting into bed, these sensations become most violent, and usually preclude all rest during the greater part of the night. The *prurigo formicans* is by most practitioners deemed contagious, and confounded with the itch. In endeavouring to ascertain the justness of this opinion, Dr. Willan has been led to make the following remarks: 1. The eruption is, for the most part, connected with internal disorder, and arises where no source of infection can be traced. 2. Persons affected may have constant intercourse with several others, and yet never communicate the disease to any of them. 3. Several persons of one family may have the *prurigo formicans* about the same time; but he thinks this should be referred rather to a common predisposition than to contagion, having observed that individuals of a family are often so affected, at certain seasons of the year, even when they reside at a distance from each other.

Although the *prurigo formicans* is never, like the former species, converted into the itch, yet it does occasionally terminate in a pustular disease, not contagious.

3. *P. senilis*. This affection does not differ much in its symptoms and external appearances from the *prurigo formicans*; but has been thought by medical writers to merit a distinct consideration, on account of its peculiar inveteracy. The *prurigo* is perhaps aggravated, or becomes more permanent, in old age, from the dry, condensed state of the skin and cuticle,

which often takes place at that period. Those who are affected with it in a high degree have little more comfort to expect during life, being incessantly tormented with a violent and universal itching. The state of the skin in the *prurigo senilis* is favourable to the production of an insect, the *pediculus humanus*, more especially to the variety of it usually termed body lice.

These insects, it is well known, are bred abundantly among the inhabitants of sordid dwellings, of jails, workhouses, &c. and in such situations prey upon persons of all ages indiscriminately. But in the *prurigo senilis* they arise, notwithstanding every attention to cleanliness or regimen, and multiply so rapidly that the patient endures extreme distress, from their perpetual irritation. The nits or eggs are deposited on the small hairs of the skin, and the pediculi are only found on the skin or on the linen, not under the cuticle, as some authors have represented. In connection with the foregoing series of complaints, Dr. Willan mentions some pruriginous affections which are merely local. He confines his observations to the most troublesome of these, seated in the *podex*, *præputium*, *urethra*, *pubes*, *scrotum*, and *puendum muliebre*. Itching of the nostrils, eyelids, lips, or of the external ear, being generally symptomatic of other diseases, do not require a particular consideration.

1. *P. podicis*. *Ascarides* in the rectum excite a frequent itching and irritation about the sphincter ani, which ceases when the cause is removed by proper medicines. A similar complaint often arises independently of worms, hæmorrhoidal tumors, or other obvious causes, which is mostly found to affect persons engaged in sedentary occupations; and may be referred to a morbid state of secretion in the parts, founded, perhaps, on a diminution of constitutional vigour. The itching is not always accompanied with an appearance of papulæ or tubercles; it is little troublesome during the day-time, but returns every night soon after getting into bed, and precludes rest for several hours. The complaint continues in this form during three or four months, and has then an intermission, till it is produced again by hot weather, fatigue, watching, or some irregularity in diet. The same disease occurs at the decline of life, under a variety of circumstances.

Women, after the cessation of the catamenia, are liable to be affected with this species of *prurigo*, more especially in summer or autumn. The skin between the nates is rough and papulated, sometimes scaly, and a little humour is discharged by violent friction. Along with this complaint, there is often an eruption of itching papulæ on the neck, breast, and back; a swelling and inflammation of one or both ears, and a discharge of matter from behind them, and from the external meatus auditorius. The *prurigo podicis* sometimes occurs as a symptom of the *lues venerea*.

2. The *P. præputii* is owing to an altered state of secretion on the glans penis, and inner surface of the *præputium*. During the heat of



summer there is also, in some persons, unusual discharge of mucus, which becomes acrimonious, and produces a troublesome itching, and often an excoriation of these parts. Washing of them with water, or soap and water, employed from time to time, relieves the complaint, and should indeed be practised as an ordinary point of cleanliness, where no inconvenience is immediately felt. If the fluid be secreted in too large a quantity, that excess may be restrained by washes made with the extract of lead, or by applying the unguentum cerusæ acetatæ.

3. *P. urethralis*. A very troublesome itching sometimes takes place at the extremity of the urethra in females, without any manifest cause. It occurs as well in young women as in those who are of an advanced age. On examination no stricture nor tumour has been found along the course of the urethra. Probably, however, the itching may be occasioned by a morbid state of the neck of the bladder being in some instances connected with pain and difficulty of making water.

An itching at the extremity of the urethra in men is produced by calculi, and by some diseases of the bladder. In cases of stricture an itching is also felt, but near the place where the stricture is situated. Another cause of it is small broken hairs, which are sometimes drawn in from the pubes, between the præputium and glans, and which afterwards becoming fixed in the entrance of the urethra, occasion an itching, or slight stinging, particularly on motion. Mr. J. Pearson, surgeon of the Lock Hospital, has seen five cases of this kind, and gave immediate relief by extracting the small hair from the urethra.

4. *P. pubis*. Itching papulæ often arise on the pubes, and become extremely sore if their tops are removed by scratching. They are occasioned sometimes by neglect of cleanliness, but more commonly by a species of pediculus, which perforates the cuticle, and thus derives its nourishment, remaining fixed in the same situation. These insects are termed by Linnaeus, &c. *pediculi pubis*; they do not, however, affect the pubes only, but often adhere to the eye-brows, eye-lids, and axillæ. They are often found, also, on the breast, abdomen, thighs, and legs, in persons of the sanguine temperament, who have those parts covered with strong hairs. It is remarkable that they seldom or never fix upon the hairy scalp. The great irritation produced by them on the skin solicits constant scratching, by which they are torn from their attachments; and painful tubercles arise at the places where they had adhered. When the pediculi are diffused over the greater part of the surface of the body, the patient's linen often appears as if sprinkled with drops of blood.

5. *P. seroti*. The scrotum is affected with a troublesome and constant itching from ascarides within the rectum, from friction by violent exercise in hot weather, and very usually from the pediculi pubis. Another and more important form of the complaint appears in

old men, sometimes connected with the prurigo podicis, and referable to a morbid state of the skin, or superficial glands of the part. The scrotum, in this case, assumes a brown colour, often also becoming thick, scaly, and wrinkled. The itching extends to the skin covering the penis, more especially along the course of the urethra; and has little respite, either by day or night.

6. The *P. pudendi muliebris* is somewhat analogous to the prurigo seroti in men. It is often a symptomatic complaint in the lichen and lepra; it likewise originates from ascarides irritating the rectum, and in some cases connected with a discharge of the fluor albus.

A similar affection arises in consequence of the change of state in the genital organs at the time of puberty, attended with a series of most distressing sensations. Dr. Willan confines his attention to one case of the disorder, which may be considered as idiopathic, and which usually affects women soon after the cessation of the catamenia. It chiefly occurs in those who are of the phlegmatic temperament, and inclined to corpulency. Its seat is the labia pudendi, and entrance of the vagina. It is often accompanied with an appearance of tension or fulness of those parts, and sometimes with inflamed itching papulæ on the labia and mons veneris. The distress arising from a strong and almost perpetual itching in the above situation may be easily imagined. In order to allay it in some degree, the sufferers have frequent recourse to friction, and to cooling applications: whence they are necessitated to forego the enjoyment of society. An excitement of venereal sensations also takes place from the constant direction of the mind to the parts affected, as well as from the means employed to procure alleviation. The complicated distress thus arising renders existence almost insupportable, and often produces a state of mind bordering on frenzy.

Deep ulcerations of the parts seldom take place in the prurigo pudendi; but the appearance of aphthæ on the labia and nymphæ is by no means unusual. From intercourse with females under these circumstances, men are liable to be affected with aphthous ulcerations on the glans, and inside of the præputium, which prove troublesome for a length of time, and often excite an alarm, being mistaken for chancres.

Women, after the fourth month of their pregnancy, often suffer greatly from the prurigo pudendi, attended with aphthæ. These, in a few cases, have been succeeded by extensive ulcerations which destroyed the nymphæ, and produced a fatal hectic: such instances are, however, extremely rare. The complaint has in general some intervals or remissions; and the aphthæ usually disappear soon after delivery, whether at the full time, or by a miscarriage.

**PRURITUS.** (from *prurio*, to itch.) See PRURIGO.

**PRUSA**, a town of Bithynia, built by king Prusias, from whom it received its name.

## PRU

**PRUSIAS**, a king of Bithynia, who flourished 221 B. C.—2. Another surnamed Venator, who gave a kind reception to Annibal, and by his advice he made war against Eumenes, king of Pergamus, and defeated him. Eumenes complained before the Romans of the hostilities of Prusias; upon which Q. Flaminius was sent from Rome to settle the disputes of the two monarchs. Prusias, upon the arrival of Flaminius, in order to gain his favour, prepared to deliver to him Annibal, who prevented his treachery by a voluntary death. Prusias was obliged to make a restitution of the provinces he had conquered, and when some time after he visited the capital of Italy, he appeared in the habit of a manumitted slave, calling himself the freeman of the Romans. Such abject behaviour rendered him contemptible in the eyes of his subjects, and when he returned home they revolted, and placed his son Nicomedes on the throne. He fled to Nicomedia, where he was assassinated near the altar of Jupiter, about 149 years B. C. Some say that his son was his murderer.

## PRU

**PRUSSIA**, a European kingdom, situated south of the Baltic, and bounded on the other sides by Russia, the grand duchy of Warsaw, the Austrian empire, the kingdoms of Saxony and Westphalia, the states of Hanover and Mecklenburg. Its shape is very irregular, and will be best conceived by inspecting the map. The greatest extent of Prussia is from north-east to south-west, which is about 480 English miles; but its breadth, in a direction perpendicular to the line of greatest extent, seldom exceeds 100 miles; except in a narrow part which stretches from north-west to south-east to the Austrian frontier, in which direction its extent is nearly 400 miles. It reaches from 11° 20' to nearly 23° of east longitude, and from the shores of the Baltic to below the 50th degree of latitude.

A recent German journal gives the following division of this kingdom, with the annexed extent and population of each province.

| Provinces.                                                                                              | Square<br>Ger. Miles. | Population. | Chief Towns. |
|---------------------------------------------------------------------------------------------------------|-----------------------|-------------|--------------|
| 1. Lithuania.....                                                                                       | 315                   | 376,578     | Gumbinnen.   |
| 2. Eastern Prussia .....                                                                                | 386                   | 454,734     | Königsberg.  |
| 3. Western Prussia .....                                                                                | 343                   | 367,067     | Elbing.      |
| 4. Pomerania .....                                                                                      | 442                   | 490,106     | Stettin.     |
| 5. New March .....                                                                                      | 209½                  | 265,714     | Custrin.     |
| 6. { Electoral March; part of the<br>{ county of Magdeburg, on the<br>{ right bank of the river Elbe. } | 416                   | 708,992     | Berlin.      |
| 7. Silesia .....                                                                                        | 668                   | 1,896,359   | Breslau.     |

The surface of the Prussian dominions is rather diversified with hills and plains than rendered abrupt and broken by mountains and valleys. All the provinces, however, but that of Silesia, may be regarded as a level country; while this last rises to considerable eminences towards the south-western limits; where it is separated from Moravia and Bohemia by a branch of the Carpathian chain. Numerous rivers and lakes also add variety and fertility to these territories. The branch of the Carpathian mountains, which partly enters Silesia, is the most elevated region in Prussia, and extends through a space of at least 150 English miles: there are also some detached mountains in the northern parts of the same province; the chief of which, according to Busching, are Spitzberg and Gratzberg; but their precise elevation, as well as that of those in other parts, appears not to have been determined. Many parts of Prussia are covered with forests; especially the eastern parts, and the mountainous regions of Silesia.

The lakes, especially in the eastern districts of the Prussian territories, are numerous. One of the largest of these is the Spelding See, in the south-east part of Prussia proper, which, including its various creeks, extends about 20 miles in every direction. Several small lakes occur in this quarter, as well as more towards

the west, in the central parts of Pomerania, and in the south-west of Brandenburg. Besides these, this kingdom presents several singular inland sheets of water, at the estuaries of some of its principal rivers, which in the German language are called haffs. One of these, denominated Grass Haff, is situated in the north-west part of Pomerania, at the mouth of the Oder. A second extends from Elbing to Königsberg, and is separated from the Baltic, to which it is nearly parallel, by a narrow slip of land, except in a small part where it communicates with that sea. This is styled Frisch Haff; is about 70 English miles in length, and from three to ten in breadth. This gulf is not of sufficient depth to admit ships of large burden; and the bank which separates it from the Baltic is said to have been thrown up by the violence of tempests, about the end of the twelfth century. Another of these gulfs commences a few miles north of the last, stretches northward, and enters the sea opposite Memel. This is called Curisch Haff; is broadest at its southern extremity, but very narrow towards the opposite end. Its length is nearly 60 English miles, and greatest breadth about half that number; while the space between it and the sea is also very narrow. It is subject to frequent storms, which in conjunction with its numerous shoals render the navigation dangerous.



Though Prussia is watered by several large rivers, they originate in foreign sources, and are received into the dominions with the accumulated waters of more than half their course. The Oder and the Pregel, however, may be regarded as Prussian rivers. The former springs from the mountains in the northern part of Moravia, soon after enters the southern parts of Silesia, flows through the middle of that province, forms a part of the boundary between Prussia and the kingdom of Saxony, crosses Brandenburg and Pomerania, and falls into the Grass Haff, after having passed through an extent of nearly 400 miles. The Pregel originates in some lakes near the south-east extremity of the dominions, and passes by Königsberg into the northern end of the Frisch Haff. The Elbe constitutes the separation between the Prussian territories and the kingdom of Westphalia. The Spree rises in the kingdom of Saxony, flows through Berlin, and enters the Elbe. The Vistula and the Memel likewise complete their courses by flowing through this kingdom; the former into the Frisch Haff, and the latter into that of Curisch.

The Prussian government is founded on a military basis; and as there is no senate, it must be regarded as an absolute monarchy. The army, which has recently been much reduced in number, consists of about 150,000 men; and as local circumstances call the whole attention of the Prussian government to the formation, discipline, and maintenance of the land forces, neither a navy nor colonies are classed among its possessions. The revenue of the crown is estimated at a little more than four millions sterling; and as there is no national debt, and the chief expense is incurred by the support of the army, this small revenue has been found equal to the expenses of the state.

Prussia produces a great deal of flax, hemp, and corn; and yellow amber is found along the sea-coast. The domestic animals are numerous; and, beside the common game, there are elks, wild asses, and uris, in the forests. The uris are of a monstrous size, and have some resemblance to beavers: their hides are extremely thick and strong, and are sold to foreigners at a great price. Königsberg is the capital. For more on the subject of Prussia, the reader may consult Mr. Myers's valuable *System of Geography*, just published; from which the substance of this article has been taken.

**PRUSSIAN BLUE.** See **PRUSSIC ACID.**

**PRUSSIATS.** Salts formed by the union of prussic acid with various bases, as sulphats are salts formed with sulphuric acid and various bases; and nitrats salts formed with nitric acid and various bases. For the means of producing prussic acid the reader must advert to the ensuing article.

The salts thus produced are as follows.

1. *Prussiat of lime*, formed by dissolving lime in prussic acid, filtering the solution, and separating the uncombined lime. It is decomposed by all the other acids, and by alkalies.

2. *Prussiat of magnesia*.—This salt may be formed by putting pure magnesia into prussic acid. In a few days the earth is dissolved, and the compound formed. The magnesia is precipitated by the alkalies and lime, and by exposure to the air.

3. *Prussiats of iron*.—As the prussiats of iron enter as ingredients into the triple salts formed by the prussic acid, it will be necessary to give some account of them before entering upon the consideration of these triple salts.

It has been demonstrated by chemists, that there are no fewer than four prussiats of iron: namely,

1. White prussiat,
2. Blue prussiat,
3. Yellow prussiat,
4. Green prussiat.

The white prussiat discovered by Mr. Proust is composed of prussic acid and protoxyd of iron. It becomes gradually blue when exposed to the atmosphere, because the oxyd absorbs oxygen, and is converted into peroxyd.

Blue prussiat, or Prussian blue, is composed of prussic acid and peroxyd of iron. It is a deep-blue powder, insoluble in water, and scarcely soluble in acids. It is composed, according to the most accurate experiments hitherto made, of equal parts of oxyd of iron and prussic acid. It is not affected by exposure to the air. Heat decomposes it by destroying the acid, and the oxyd of iron remains behind. The Prussian blue of commerce, besides other impurities, contains mixed with it a great quantity of alumina.

Yellow prussiat is composed of prussic acid combined with an excess of peroxyd of iron: it is therefore a sub-prussiat of iron. This prussiat is soluble in acids. It may be obtained by digesting the alkalies or alkaline earths with Prussian blue. Part of the acid is carried off by these bodies, and the yellow prussiat remains in the state of a powder.

Green prussiat, first discovered by Mr. Berthollet, is composed of oxyprussic acid, and peroxyd of iron. It is therefore in fact an oxyprussiat.

4. *Prussiat of barytes and iron*.—For the first accurate description of this salt, we are indebted to the ingenious Mr. William Henry. It may be formed by adding Prussian blue to hot barytes water till it ceases to be discoloured. The solution, when filtered and gently evaporated, yields crystals of prussiat of barytes and iron.

These crystals have the figure of rhomboidal prisms; they have a yellow colour, and are soluble in 1920 parts of cold water, and in about 100 parts of boiling water. In a red heat they are decomposed, the acid being destroyed. They are soluble in nitric and muriatic acids: sulphuric acid occasions a precipitate of sulphat of barytes.

5. *Prussiat of lime and iron*.—This salt was perhaps first mentioned by Mr. Hagen; but we are indebted to Morveau for the first ac-

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curate account of its properties and preparation.

Upon two parts of Prussian blue of commerce, previously well washed with a sufficient quantity of boiling water to separate all the foreign salts, about 56 parts of lime-water are to be poured, and the mixture must be boiled for a short time till the lime is saturated with the prussic acid, which is known by its no longer altering paper stained with turmeric: it is then to be filtered.

This liquid, which contains the triple prussiat of lime in solution, has a greenish-yellow colour: its specific gravity is 1.005; and it has an unpleasant bitterish taste. When evaporated to dryness, it yields small crystalline grains, soluble without alteration in water. It is insoluble in alcohol.

This triple prussiat may be used with advantage as a test to ascertain the presence of metals held in solution. The only impurity which it contains is a little sulphat of lime.

6. *Prussiat of potass and iron.*—This salt, known also by the names of Prussian alkali, phlogisticated alkali, Prussian test, triple prussiat of potass, &c. has been chosen by chemists as the best combination of prussic acid for detecting the presence of metals, and more especially for detecting the existence of iron. To chemists and mineralogists, it is one of the most important instruments ever invented; as, when properly prepared, it is capable of indicating whether any metallic substance (plantinum excepted) is present in any solution whatever, and even of pointing out the particular metal, and of ascertaining its quantity. This it does by precipitating the metals from their solution in consequence of the insoluble compound which it forms with them; and the colour of the precipitate indicates the particular metal, while its quantity enables us to judge of the proportion of metallic oxyd contained in any solution.

In order to be certain of the accuracy of these results, it is necessary to have a Prussian alkali perfectly pure, and to be certain beforehand of the quantity, or rather of the proportions, of its ingredients. To obtain a test of this kind has been the object of chemists ever since the discoveries of Macquer pointed out its importance. It is to the use of impure tests that a great part of the contradictory results of mineralogical analysis by different chemists is to be ascribed.

The great object of chemists at first was to obtain this prussiat entirely free from iron; but their attempts uniformly failed, because the oxyd of iron is one of its necessary component parts. This was first properly pointed out by Morveau.

There are two ways in which this test may be rendered impure, besides the introduction of foreign ingredients, which it is needless to mention, because it is obvious that it must be guarded against. 1. There may be a superabundance of alkali present, or, which is the same thing, there may be mixed with the

Prussian test a quantity of pure alkali: or, 2. There may be contained in it a quantity of yellow prussiat of iron, for which prussiat of potass has also a considerable affinity.

If the Prussian test contains a superabundance of alkali, two inconveniences follow. This superabundant quantity will precipitate those earthy salts which are liable to contain an excess of acid, and which are only soluble by that excess: hence alumina and barytes will be precipitated. It is to the use of impure tests of this kind that we owe the opinion, that barytes and alumina are precipitated by the Prussian alkali, and the consequent theories of the metallic nature of these earths. This mistake was first corrected by Meyer of Steint.

Another inconvenience arising from the superabundance of alkali in the Prussian test is, that it gradually decomposes the blue prussiat which the test contains, and converts it into yellow prussiat. In what manner it does this will be understood, after what has been said, without any explanation.

On the other hand, when the Prussian alkali contains a quantity of yellow prussiat of iron, as great inconveniences follow. This yellow prussiat has an affinity for prussic acid, which, though inferior to that of the potass, is still considerable; and, on the other hand, the potass has a stronger affinity for every other acid than for the prussic. When, therefore, the test is exposed to the air, the carbonic acid which the atmosphere always contains, assisted by the affinity between the yellow prussiat and the prussic acid, decomposes the prussiat of potass in the test, and the yellow prussiat is precipitated in the form of Prussian blue; and every other acid produces the same effect. A test of this kind would indicate the presence of iron in every mixture which contains an acid (for a precipitation of Prussian blue would appear), and could not therefore be employed with any confidence.

To describe the various methods proposed by chemists for preparing this salt would be unnecessary, as the greater number do not answer the purpose intended. The method practised by Klaproth, first made known to chemists by Westrum, and afterwards described in our language by Kirwan, is considered as one of the best. It is as follows:

Prepare pure potass, by gradually projecting into a large crucible, heated to whiteness, a mixture of equal parts of purified nitre and crystals of tartar; when the whole is injected let it be kept at a white heat for half an hour, to burn off the coal. Detach the alkali thus obtained from the crucible, reduce it to powder, spread it on a muffle, and expose it to a white heat for half an hour. Dissolve it in six times its weight of water, and filter the solution while warm. Pour this solution into a glass receiver, placed in a sand-furnace heated to 170° or 180°; and then gradually add the best Prussian blue in powder, injecting new portions according as the former become



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grey, and supplying water as fast as it evaporates; continue until the added portions are no longer discoloured, then increase the heat to  $212^{\circ}$ , and continue it for half an hour. Filter the ley thus obtained, and saturate it with sulphuric acid moderately diluted; a precipitate will appear: when this ceases, filter off the whole, and wash the precipitate. Evaporate the filtered liquor to about one quarter, and set it by to crystallize: after a few days, yellowish crystals of a cubic or quadrangular form will be found, mixed with some sulphat of potass and oxyd of iron; pick out the yellowish crystals, lay them on blotting-paper, and re-dissolve them in four times their weight of cold water, to exclude the sulphat of potass.

Assay a few drops of this solution with barytes water, to see whether it contains any sulphuric acid, and add some barytes water to the remainder if necessary: filter off the solution from the sulphat of barytes, which will have precipitated, and set it by to crystallize for a few days; that the barytes, if any should remain, may be precipitated. If the crystals now obtained are of a pale yellow colour, and discover no blueish streaks when sprinkled over with muriatic acid, they are fit for use; but if they still discover blueish or green streaks, the solutions and crystallizations must be repeated.

These crystals must be kept in a well-stopped bottle, which, to preserve them from the air, should be filled with alcohol, as they are insoluble in it.

Before they are used, the quantity of iron they contain should be ascertained, by heating 100 grains to redness for half an hour in an open crucible: the prussic acid will be consumed, and the iron will remain in the state of a reddish-brown magnetic oxyd, which should be weighed and noted. This oxyd is half the weight of the Prussian blue afforded by the Prussian alkali: its weight must therefore be subtracted from that of metallic precipitates formed by this test. Hence the weight of the crystals, in a given quantity of the solution, should be noted, that the quantity employed in precipitation may be known. Care must be taken to continue the calcination till the oxyd of iron becomes brown; for while it is black, it weighs considerably more than it should.

Another good method of preparing this salt has been lately given by Mr. Henry; but it is rather too expensive for general use. It consists in first forming a triple prussiat of barytes, and adding it in crystals to a solution of carbonat of potass till the solution no longer restores the colour of reddened litmus paper. After digesting the mixture for half an hour, filter the liquid, and evaporate it gently. The triple prussiat of potass crystallizes.

7. Besides this triple salt, which is often, for the sake of abbreviation, called prussiat of potass, though iron is a constituent part, a simple prussiat of iron may also be obtained. It cannot however be made by the direct combination of the prussic acid and iron, but is

always the result of the decomposition of the solution of iron in another acid. When the pure prussic acid is added to any solution of this metal, the prussiat of iron thus formed is at first green, and is soluble in acids; hence much of it, and often the whole, remains in the solution, and no precipitate occurs. But on exposure to the rays of light, or to sulphuric acid, or if metallic iron be added to the solution, the colour becomes blue, and the prussiat, which is now no longer soluble in the acids, falls down. Whence it would appear that pure blue prussiat of iron (which may be distinguished from Prussian blue by containing nothing but prussic acid and oxyd of iron) holds the metal in a less oxygenated state than in the green solution.

8. *Prussiat of mercury.*—The prussic acid exercises so strong an action on the oxyd of mercury, that even corrosive muriat is decomposed by Prussian blue, as indeed are all the oxyds of this metal in an equal degree. The prussiat of mercury duly evaporated crystallizes in tetrahedral prisms. It is the only simple combination of this acid and a metallic oxyd which will crystallize.

9. *Prussiat of silver.*—The pure prussic acid when added to nitrated silver precipitates a white prussiat of silver. When this metal is previously separated from its solution by carbonat of soda, this acid unites with it and forms white prussiat as before, and expels the carbonic acid which it contains.

10. *Prussiat of copper.*—Digested with the carbonated oxyd of copper, the pure prussic acid effervesces and turns it of a faint lemon colour, but it does not alter the solutions of this metal. If the pure prussiat of lime be added to the sulphat of copper, it first precipitates a lemon-coloured prussiat of copper, which more of the liquor redissolves, and this solution is soluble in ammonia without turning it blue. If more of the sulphat of copper be added, the precipitate in like manner will disappear.

The other metallic prussiats are similarly formed, but of little importance.

11. *Prussiat of strontian.*—This salt is prepared like that of barytes by digesting Prussian blue with the pure earth: but this prussiat does not readily crystallize, and appears to be extremely insoluble in water.

**PRUSSIC ACID**, an acid of a very singular nature, and of very essential use in a variety of chemical operations, as also regarded as a pigment in manufactures. It was discovered about a century ago by Diesbach at Berlin; and a method of preparing it was published by Woodward in the Philosophical Transactions for 1724, which he said he had got from one of his friends in Germany. This method was as follows: Detonate together four ounces of nitre and as much tartar, in order to procure an extemporaneous alkali; then add four ounces of dried bullock's blood; mix the ingredients well together, and put them into a crucible covered with a lid, in which there is a small hole; calcine with a moderate fire till the blood emits no more smoke or flame capa-

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ble of blackening any white body exposed to it: increase the fire towards the end, so that the whole matter contained in the crucible shall be moderately but sensibly red. In this state throw it into two pints of water, and boil it for half an hour. Decant off this water, and continue to pour on more till it comes off insipid. Add all these liquids together, and boil them down to two pints. Dissolve two ounces of sulphat of iron and eight ounces of alum in two pints of boiling water; mix this with the former liquor while both are hot. An effervescence takes place, and a powder is precipitated, of a green colour mixed with blue. Separate this precipitate by filtration, and pour muriatic acid upon it till it becomes of a beautiful blue; then wash it with water and dry it.

Different explanations were given of the nature of this precipitate by different chemists. All of them acknowledged that it contained iron; but to account for the colour was the difficult point. Brown, and Geoffroy, and Neuman, discovered in succession, that a great many other animal substances besides blood communicated to alkalies the property of forming Prussian blue; but the theories by which they attempted to account for its formation were altogether nugatory. At last a very important step was made in the investigation of this compound by Macquer, who published a dissertation on it in the year 1752.

This celebrated chemist ascertained the following facts: 1. When an alkali is added to a solution of iron in any acid, the iron is precipitated of a yellow colour, and soluble in acids; but if iron is precipitated from an acid by an alkali prepared by calcination with blood (which has been called a Prussian alkali), it is of a green colour. 2. Acids dissolve only a part of this precipitate, and leave behind an insoluble powder, which is of an intense blue colour. The green precipitate, therefore, is composed of two different substances, one of which is Prussian blue. 3. The other is the brown or yellow oxyd of iron; and the green colour is owing to the mixture of the blue and yellow substances. 4. When heat is applied to this Prussian blue, its blue colour is destroyed, and it becomes exactly similar to common oxyd of iron. It is composed, therefore, of iron and some other substance, which heat has the property of driving off. 5. If it is boiled with a pure alkali, it loses its blue colour also, and at the same time the alkali acquires the property of precipitating of a blue colour solutions of iron in acids, or it has become precisely the same with the Prussian alkali. 6. Prussian blue, therefore, is composed of iron and something which a pure alkali can separate from it, something which has a greater affinity for alkali than for iron. 7. By boiling a quantity of alkali with Prussian blue, it may be completely saturated with this something, which may be called colouring matter. 8. No acid can separate this colouring matter from iron after it is once united with it. 9. When iron dissolved in an acid is mixed with an alkali

saturated with the colouring matter, a double decomposition takes place, the acid unites with the alkali, and the colouring matter with the iron, and forms Prussian blue. 10. The reason that, in the common method of preparing Prussian blue, a quantity of yellow oxyd is precipitated, is, that there is not a sufficient quantity of colouring matter (for the alkali is never saturated with it) to saturate all the iron displaced by the alkali; a part of it, therefore, is mixed with Prussian blue. Muriatic acid dissolves this oxyd, carries it off, and leaves the blue in a state of purity.

Such were the conclusions which Macquer drew from his experiments; experiments which not only discovered the composition of Prussian blue, but threw a ray of light on the nature of affinities, which has contributed much towards the advancement of that important branch of chemistry.

The nature of the colouring matter, however, was still unknown. At length, in 1772, Morveau announced his suspicion that the colouring matter was probably an acid.

Such was the knowledge of chemists respecting the nature of this colouring matter, when Scheele all at once removed the veil, and explained its properties and composition. He observed that the Prussian alkali, after being exposed for some time to the air, lost the property of forming Prussian blue; the colouring matter must therefore have left it. He put a small quantity of it into a large glass globe, corked it up, and kept it some time; but no change was produced either in the air or the Prussian alkali. Something must therefore displace the colouring matter when the alkali is exposed to the open air, which is not present in a glass vessel. Was it carbonic acid gas? To ascertain this, he put a quantity of Prussian alkali into a glass globe filled with that gas, and in 24 hours the alkali was incapable of producing Prussian blue. It is therefore carbonic acid gas which displaces the colouring matter. He repeated this experiment with this difference, that he hung in the globe a bit of paper which had been previously dipped into a solution of sulphat of iron, and on which he had let fall two drops of an alkaline lixivium in order to precipitate the iron. This paper was taken out in two hours, and became covered with a fine blue on adding a little muriatic acid. Carbonic acid, then, has the property of separating the colouring matter from alkali without decomposing it.

He found also that other acids produce the same effect. Hence he concluded, that the colouring matter might be obtained in a separate state. Accordingly he made a great many attempts to procure it in that state, and at last discovered the following method, which succeeds perfectly.

Mix together ten parts of Prussian blue in powder, five parts of the red oxyd of mercury, and thirty parts of water, and boil the mixture for some minutes in a glass vessel. The blue colour disappears, and the mixture becomes



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yellowish-green. Pour it upon a filter; and after all the liquid part has passed, pour ten parts of hot water through the filter to wash the residuum completely. The oxyd of mercury decomposes Prussian blue, separates its colouring matter, and forms with it a salt soluble in water. The liquid, therefore, which has passed through the filter contains the colouring matter combined with mercury. The other component parts of the Prussian blue, being insoluble, do not pass through the filter. Pour this mercurial liquid upon  $2\frac{1}{2}$  parts of clean iron filings, quite free from rust. Add at the same time one part of concentrated sulphuric acid, and shake the mixture. The iron filings are dissolved, and the mercury formerly held in solution is precipitated in the metallic state. The cause of this sudden change is obvious: the iron deoxygenizes the mercury, and is at the same instant dissolved by the sulphuric acid, which has a stronger affinity for it than the colouring matter has. There remain in solution, therefore, only sulphat of iron and the colouring matter.

Now the colouring matter being volatile, which the sulphat of iron is not, it was easy to obtain it apart by distillation. Accordingly he distilled the mixture in a gentle heat: the colouring matter came over by the time that one-fourth of the liquor had passed into the receiver. It was mixed, however, with a small quantity of sulphuric acid; from which he separated it by distilling a second time over a quantity of carbonat of lime. The sulphuric acid combines with the lime, and remains behind, which the colouring matter cannot do, because carbonic acid has a stronger affinity for lime than it has. Thus he obtained the colouring matter in a state of purity.

It remained now to discover its component parts. He formed a very pure Prussian blue, which he distilled, and increased the fire till the vessel became red. The small quantity of water which he had put into the receiver contained a portion of the blue colouring matter and of ammonia; and the air of the receiver consisted of azote, carbonic acid gas, and the colouring matter. He concluded, from this and other experiments, that the colouring matter is a compound of ammonia and oil. But when he attempted to verify this theory by combining together ammonia and oil, he could not succeed in forming colouring matter. This obliged him to change his opinion; and at last he concluded that the colouring matter is a compound of ammonia and charcoal. He mixed together equal quantities of pounded charcoal and potass, put the mixture into a crucible, and kept it red-hot for a quarter of an hour: he then added a quantity of sal ammoniac in small pieces, which he pushed to the bottom of the melted mixture, kept it in the fire for two minutes till it had ceased to give out vapours of ammonia, and then threw it into a quantity of water. The solution possessed all the properties of the Prussian alkali. Thus Mr. Scheele succeeded in forming the colouring matter.

This colouring matter was called prussic acid by Morveau, in the first volume of the chemical part of the *Encyclopedie Methodique*; an appellation which is now generally received.

These admirable experiments of Scheele were repeated and carried still farther, by Berthollet, in 1787, who applied to the explanation of the composition of the colouring matter the light which had resulted from his previous experiments on the component parts of ammonia. This illustrious chemist, scarcely inferior to Scheele in ingenuity and address, ascertained, in the first place, that the prussic alkali is a triple salt, composed of prussic acid, the alkali, and oxyd of iron; that it may be obtained in octahedral crystals; and that when mixed with sulphuric acid, and exposed to the light, it lets fall a precipitate of Prussian blue. His next object was, to ascertain the component parts of prussic acid. When oxymuriatic acid is poured into prussic acid obtained by Scheele's process, it loses its oxygen, and is converted into common muriatic acid. At the same time the prussic acid becomes more odorous and more volatile, less capable of combining with alkalies, and precipitates iron from its solutions, not blue, but green. Thus prussic acid, by combining with oxygen, acquires new properties, and is converted into a new substance, which may be called oxyprussic acid. If more oxymuriatic acid gas is made to pass into prussic acid, and it is exposed to the light, the prussic acid separates from the water with which it was combined, and precipitates to the bottom in the form of an aromatic oil; which heat converts into a vapour insoluble in water, and incapable of combining with iron. When the green precipitate, composed of oxyprussic acid and iron, is mixed with a pure fixed alkali, the oxyprussic acid is decomposed, and converted into carbonat of ammonia.

From these experiments, Berthollet concluded, that prussic acid does not contain ammonia ready-formed; but that it is a triple compound of carbon, hydrogen, and azote, in proportions which he was not able to ascertain. This conclusion has been still farther verified by Mr. Clouet, who found that when ammoniacal gas is made to pass through a red-hot porcelain tube containing charcoal, a quantity of prussic acid is formed. This experiment does not succeed unless a pretty strong heat is applied to the tube.

Fourcroy and several other chemists believe, that the prussic acid contains also a portion of oxygen in its composition, resting chiefly upon the following experiments of Vauquelin:

Exper. I. Put into a retort 100 parts of the muriat of ammonia, 50 parts of lime, and 25 parts of charcoal in fine powder; adapt to the retort a receiver containing a slight solution of the sulphat of iron, and immerse into it the beak of the retort; then apply a brisk heat, and continue the action of the fire until nothing more is disengaged.

Exper. II. Put into a retort 100 parts of the muriat of ammonia, 50 parts of semivitre-

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ous oxyd of lead, and 25 parts of charcoal: adapt a receiver containing a solution of sulphat of iron, and proceed as before. Stir well the liquors contained in the receivers, and expose them to the air for several days, in order that the combination between the oxyd of iron and the prussic acid may be perfect, and that the prussiat of iron may absorb as much oxygen as is necessary for its passing to the state of blue prussiat, and for its being proof against acids: then pour into these liquors equal quantities of sulphuric acid well diluted with water, and you will have Prussian blue, the quantities of which will be as one to six; that is to say, the Prussian blue of the experiment in which Vauquelin employed oxyd of lead was six times more abundant than that of the experiment in which he employed only lime to disengage the ammonia.

Having thus traced the gradual progress of philosophers in ascertaining the nature of the prussic acid, it only remains to give an account of its properties, which were first examined by the indefatigable Scheele.

Prussic acid obtained by Scheele's process is a colourless liquid like water. It has a strong odour, resembling that of the flowers of the peach, or of bitter almonds. Its taste is sweetish, acrid, and hot, and apt to excite cough. It does not alter the colour of vegetable blues.

It is exceedingly volatile, and evidently capable of assuming the gaseous form; though it has never been obtained apart, nor examined in that state. At a high temperature (when united to a base), it is decomposed and converted into ammonia, carbonic acid, and carbureted hydrogen gas.

It unites difficultly with alkalies and earths, and is separated from them much more easily than from metallic oxyds. Mere exposure to the light of the sun, or to a heat of  $110^{\circ}$ , is sufficient for that purpose. These combinations are decomposed also by all the acids.

It has no action on metals; but it unites with their oxyds, and forms with them salts, which are almost all insoluble, if we except prussiats of mercury and manganese. These compounds are not decomposed by acids. Yet the prussic acid is not capable of taking the metallic oxyds from the other acids.

Prussic acid has a great tendency to enter into triple compounds, combining at once with an alkali and a metallic oxyd; and these compounds are much more permanent and difficult to decompose than its single combinations.

The affinities of this acid, as far as they have been ascertained, are as follows:

Barytes,  
Strontian,  
Potass,  
Soda,  
Lime,  
Magnesia,  
Ammonia.

It does not seem capable of combining with alumina.

This acid is of great importance to the che-

mist, in consequence of the property which it has of forming insoluble compounds with metallic oxyds, and almost with metallic oxyds alone. This puts it in our power to ascertain the presence of a metallic body held in solution. When the prussic acid is dropt in, a precipitate appears if a metal is present. The colour of this precipitate indicates the metal, and the quantity of it enables us to ascertain the quantity of metal contained in the solution. It is used especially to indicate the presence of iron, which it does by the blue colour that the solution assumes: and to free solutions from iron, which it does by precipitating the iron in the form of Prussian blue.

It is evident, however, that the pure prussic acid cannot be employed for these purposes, because it is incapable of taking metallic oxyds from other acids. It is always employed combined with an alkaline or earthy basis. In that state it decomposes all metallic salts by a compound affinity. The base most commonly employed is potass or lime; and indeed it is most usually employed in the state of a triple salt, composed of prussic acid, potass, and oxyd of iron, which is preferred because it is not apt to be decomposed by the action of the atmosphere.

Of all the metallic solutions tried by Scheele, pure prussic acid occasioned only a precipitate in three, namely,

1. Nitrat of silver precipitated white.
2. Nitrat of mercury precipitated black.
3. Carbonat of iron precipitated green becoming blue.

It has no action on the oxyds of

|           |                |
|-----------|----------------|
| Platinum, | Antimony,      |
| Iron,     | Manganese,     |
| Tin,      | Arsenic acid,  |
| Lead,     | Molybdic acid. |
| Bismuth,  |                |

Gold precipitated by the alkaline carbonats is rendered white by this acid.

It disengages carbonic acid from the oxyd of silver precipitated by the same alkalies; but the oxyd remains white.

It dissolves red oxyd of mercury, and forms with it a salt which may be obtained in crystals.

Oxyd of copper precipitated by carbonat of potass, effervesces in it, and acquires a slight orange-yellow colour.

Oxyd of iron precipitated from the sulphat of iron, by carbonat of potass, effervesces in it, and becomes blue.

Oxyd of cobalt precipitated by the same alkali, gives in it some marks of effervescence, and becomes a yellowish brown.

The compounds which prussic acid makes with zirconia and yttria, seem also to be insoluble; for these earths are precipitated from their solutions by prussiat of potass; a circumstance in which they differ from all the other earths and alkalies, and which indicates a coincidence between them and the metallic oxyd.

One of the most obvious characters of this acid is its peach-blossom smell, and by this as



well as by the blue precipitate which it forms with solutions of iron, it is often detected during a variety of decomposing operations of animal substances whether spontaneous or artificial. Thus Vauquelin found it produced by the action of nitric acid on serum, and Fourcroy and others have discovered it as an occasional product (though rare) of animal putrefaction. It is also contained in small quantities in the vegetable kingdom; and here the smell is sometimes an indication, as in bitter-almonds, peach-flowers, the leaves of the lauro-cerasus, &c. As these contain a poisonous principle, it has been conjectured, with some probability, that it may reside in the prussic acid, which is itself highly deleterious.

M. Shrader detected this acid in these vegetable substances by adding lime to the concentrated effusion or distilled water, and afterwards applying a solution of iron and acid. Vauquelin also obtained a notable quantity of the prussic acid in the distilled waters from the kernels of apricots and of bitter almonds. These waters were mixed with a solution of iron, then precipitated entirely by ammonia, and after stirring the mixture, and letting it repose for some hours, sulphuric acid was added, which dissolved the excess of oxyd of iron, and left an insoluble blue-green precipitate, which retained its colour for some days, but immediately became blue in the heat of boiling water.

PRUTH, a river of Poland, which rises in Red Russia, in the mountain of Crapach, crosses part of the palatinate of Lemburg, runs through all Moldavia, and falls into the Danube.

To PRY. *v. n.* (of unknown derivation.) To peep narrowly; to inspect officiously, curiously, or impertinently (*Shakspeare*).

PRYTANES, in Grecian antiquity, were the presidents of the senate, whose authority consisted chiefly in assembling the senate; which, for the most part, was done once every day. The senate consisted of 500, 50 senators being elected out of each tribe: after which, lots were cast, to determine in what order the senators of each tribe should preside; which they did by turns, and during their presidency were called prytanes. However, all the 50 prytanes of the tribes did not govern at once, but one at a time, viz. for seven days; and after 35 days, another tribe came into play, and presided for other five weeks, and so of the rest.

PSALM, a divine song or hymn; but chiefly appropriated to the 150 psalms of David, a canonical book of the Old Testament. Most of the psalms have a particular title, signifying either the name of the author, the person who was to set it to music or sing it, the instrument that was to be used, or the subject and occasion of it. Some have imagined that David was the sole author of the Book of Psalms; but the titles of many of them prove the contrary, as psalm xc, which appears to have been written by Moses. Many of the psalms are

inscribed with the names Korah, Jeduthun, &c. from the persons who were to sing them.

PSALMANAZAR (George), an extraordinary character, whose real name and birth-place are unknown, though he is supposed to be a native of France. Educated among the jesuits, he began early to impose upon the world, first as a pilgrim, and afterwards as a native of Formosa. He travelled from Germany to Liege, pretending to be a Japanese converted to christianity; but afterwards he professed himself to be a heathen, and by the zeal of the chaplain of Lauder's regiment, at Sluys, he was converted to christianity, and baptized. This procured him an easy introduction to Compton, bishop of London, who took him into his house. He was prevailed on to translate the church catechism into the Formosan language, and he also composed a grammar of that language; and though some suspected the imposition, he was generally considered by the learned as a man of superior abilities. He afterwards published his history of Formosa, which quickly passed through two editions; and to obtain greater confidence, he accustomed himself to feed on raw flesh, roots, and herbs. Some absurdities, however, were discovered in his history, and at last, after living long on the credulity of the public, he confessed himself an impostor. Thus abandoned by his former patrons, he yet found sufficient means to subsist by his pen; and undertook a share in the universal history. He died 1763, ashamed of the vile imposition he had practised.

PSALMIST, in the church of Rome, one of the lesser ecclesiastical orders; the same with what among us is called clerk, precentor, or singer.

PSALMODY, the art or act of singing psalms. See PSALM. Psalmody was always esteemed a considerable part of devotion, and usually performed in the standing posture: and as to the manner of pronunciation, the plain song was sometimes used, being a gentle inflection of the voice, not much different from reading, like the chaunt in cathedrals; at other times more artificial compositions were used, like our anthems.

As to the persons concerned in singing, sometimes a single person sung alone; sometimes the whole assembly joined together, which was the most ancient and general practice. At other times, the psalms were sung alternately, the congregation dividing themselves into two parts, and singing verses about, in their turns. There was also a fourth way of singing, pretty common in the fourth century, which was, when a single person began the verse, and the people joined with him in the close: this was often used for variety, in the same service with alternate psalmody.

The use of musical instruments, in the singing of psalms, seems to be as ancient as psalmody itself; the first psalm we read of being sung to the timbrel, viz. that of Moses and Miriam, after the deliverance of the Israelites

from Egypt: and afterwards, musical instruments were in constant use in the temple of Jerusalem.

**PSALTER**, the same with the book of psalms. See the article **PSALM**. Among the religious in the Popish countries, the term psalter is also given to a large chaplet or rosary, consisting of 150 beads, according to the number of psalms in the psalter.

**PSALTERIUM** (*psalterium*, a harp; because it is marked with lines that give it the appearance of a harp.) *Lyra*. In anatomy, the medullary body that unites the posterior crura of the for-nix of the brain.

**PSALTERY**, a musical instrument, much in use among the ancient Hebrews, who called it nebel. We know little or nothing of the precise form of the ancient psalter. That now in use is a flat instrument, in form of a trapezium or triangle truncated at top: it is strung with 13 wire-chords, set to unison or octave, and mounted on two bridges, on the two sides: it is struck with a plectrum, or little iron rod, and sometimes with a crooked stick. Its chest or body resembles that of a spinet.

**PSAMMETICUS**, or **PSAMMITICHUS**, a renowned conqueror, who, subduing 11 other petty kings of Egypt, became the founder of the kingdom of Egypt, about 670 B. C. He is memorable likewise for taking the city of Azot, after a siege of 29 years; and for discovering the sources of the river Nile.

**PSAPHO**, a Libyan who taught a number of birds which he kept to say, "Psapho is a god," and afterwards gave them their liberty. The birds did not forget the words which they had been taught, and the Africans paid divine honours to Psapho.

**PSATHURA**, in botany, a genus of the class hexandria, order monogynia. Calyx superior, six-toothed; corol campanulate, six-cleft, bearded within; stigma lamellate; drupe dry, striate, six-celled, with a seed in each cell. One species; a shrub of the isle of Bourbon, with knotty fragile branches; terminal panicle.

**PSATYRIANS**, a sect of Arians, who, in the council of Antioch, held in the year 360, maintained, that the Son was not like the Father as to will; that he was taken from nothing, or made of nothing; and that, in God, generation was not to be distinguished from creation.

**PSSELLISMUS**. (*ψελλισμος*; from *ψελλίζω*, hesitation of speech.) Defect of speech. A genus of disease in the class locales and order dyscenesiæ of Cullen.

**PSEUDO**, from *ψευδος*, a Greek term used in the composition of many words, to denote false or spurious: as the pseudo-acacia, or bastard-acacia; pseudo-fumaria, or bastard-fumitory; pseudo-ruta, or bastard-rue, &c. We also say, a pseudo-apostle, or false apostle; a pseudo-prophet, or false prophet, &c.

**PSEUDO-ACACIA**, in botany. See **ROBINIA**.

**PSEUDO-ACORUS**, in botany. See **IRIS**.  
**PSEUDO-ASPHODELUS**, in botany. See **ANTHERICUM**.

**PSEUDO-CAPSICUM**, in botany. See **SOLANUM**.

**PSEUDO-DIGITALIS**, in botany. See **DRA-COCEPHALUM**.

**PSEUDOBLEPSIS**. (*ψευδοβλεψις*; from *ψευδος*, false, and *βλεψις*, sight.) Imaginary vision of objects. A genus of disease in the class locales and order dyæsthesiæ of Cullen; characterized by depraved sight, creating objects, or representing them different from what they are. Species: 1. Pseudoblepsis imaginaria, in which objects are perceived that are not present. 2. Pseudoblepsis mutans, in which objects that are present appear somewhat changed.

**PSEUDOGRAPHY**. *s.* False writing.  
**PSEUDOLOGY**. *s.* Falsehood of speech.

**PSEUDONYMUS**, among critics, an author who publishes a book under a false or feigned name; as cryptonymus is given to him who publishes one under a disguised name, and anonymous to him who publishes without any name at all.

**PSEUDOPYRETHRUM**. See **PTARMICA**.

**PSHAW!** An expression or interjection of contempt.

**PSIADIA**, in botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle naked; down simple, sessile; calyx imbricate, ovate; florets of the ray abbreviated. One species; an erect shrub of Mauritius with corymbed flowers.

**PSIDIUM**. Guava. In botany, a genus of the class icosandria, order monogynia. Calyx five-cleft, superior; petals five; berry one or four-celled, many-seeded. Eight species; natives of the East and West Indies and South America. The two following are cultivated.

1. *P. pomiferum*. Red, or apple-guava. Trunk thick, twenty feet high, branchy; bark smooth; leaves oblong-lanceolate, pubescent underneath; peduncles three-flowered; petals large and white; fruit pomegranate-shaped, crowned, when ripe having an agreeable fragrance. A native of both the Indies.

2. *P. pyriferum*. White or pear-guava. Size that of a moderate apple-tree; bark smoothish, yellow-brown with ash-coloured spots; branchy; wood very hard and tough, used for ox-yokes and other articles of agriculture; leaves elliptic, pubescent beneath; peduncles one-flowered; flower white and fragrant; fruit about the size of a hen's egg; pulp rather firm, full of bony seeds, flesh-coloured, aromatic, and agreeable. A native of both the Indies. The apple kind is most cultivated in the Indies, on account of the pulp having a fine acid flavour, whereas the pear species is sweet, and therefore not so agreeable in warm climates. Of the inner pulp of either the inhabitants make jellies, and of the outer rind they make tarts, marmalades, &c. The latter they also stew and eat with milk, and prefer them to any



other stewed fruits. They have an adstringent quality, which exists also in every part of the tree, and abundantly in the leaf buds, which are occasionally boiled with barley and liquorice, as an excellent drink against diarrhæas. A simple decoction of the leaves, used as a bath, is said to cure the itch and most cutaneous eruptions.

These plants are increased by seeds, which must be procured from their native soil; they must be sown in pots, filled with rich kitchen garden earth, plunged into a tan-bed.

**PSILOTUM**, in botany, a genus of the class cryptogamia, order filices. Capsules globular, about three-grained, scattered, axillary, lateral, sessile, three-celled, opening by three valves at top; seeds very numerous. Two species; exotic ferns.

**PSITTACUS**. Parrot. In zoology, a genus of the class aves, order picæ. Bill hooked; upper mandible moveable, (mostly) covered with a cere; nostrils rounded, placed in the base of the bill; tongue fleshy, obtuse, entire; feet formed for climbing.

There are 170 species, thus subdivided:

A. Tail long, wedge-shaped.

B. Tail short, equal at the end, including the cockatoos and lorries generally, but not altogether.

Of all foreign birds, this genus is the best known in Europe: from its docility, and the beauty of its plumage, it has been imported in great numbers, and in those countries where it is indigenous, it is the most numerous of all the feathered tribes. The parrot is an intra-tropical bird, and is found from twenty-four to twenty-five degrees on either side of the equator. Although it lives in the temperate climates of Europe, yet it does not frequently breed there; and its spirits and longevity are diminished in a temperature so little suited to the warmth of its constitution. Parrots are so various in size, and in the shades and distributions of their colours, that it is utterly impossible for language to follow these countless gradations, and the task, though it could be accomplished, would neither prove instructive nor entertaining.

It is remarkable, that of the different species of parrots that are known and described, there is not one common to the New and the Old World. Something like this is observable also in the case of quadrupeds; none of those belonging to the tropical regions in the one continent being discoverable in the same latitudes of the other. No animal that is incapable of bearing the rigours of cold is found to pass from the Old to the New World, because it is only in the regions of the north that these are ascertained approximate. Notwithstanding its attribute of flight, the parrot is incapable of traversing that vast space which lies between Africa and the East Indies; and all the different tribes of this large class remain confined to their primitive stations on each hemisphere. So short and heavy indeed are their flights, that they can hardly cross an arm of the sea seven or eight leagues broad; hence, almost every

island in the West Indies is distinguished by a race of parrots peculiar to itself.

Man has always most admired those animals that seemed to participate most largely of his own nature. The monkey, by its resemblance to his external form, and the parrot by imitating his voice, have excited his wonder, and been deemed a peculiar and privileged race, destined to fill up the intermediate space between him and the brute creation. Savages, who are in general so insensible to the grand spectacle of nature, have viewed these animals with astonishment and delight. They stop their canoes for hours together, to behold the gesticulations of the monkey; and they take such pleasure in taming and educating parrots, that they are said by Buffon to possess the secret of enriching and varying the hue of their plumage; an art to which the more civilized nations of Europe are still strangers.

The Greeks at first knew only one species of parrot, which was imported from the east by one of the captains of Alexander's fleet. Aristotle, the father of naturalists, speaks of it as a rare bird, of which he had only heard by report. The beauty of parrots, and their faculty of speech, soon made them objects of high request among the luxurious Romans, whom the virtuous Cato justly reproaches for this puerile attachment. In his time, they kept them in cages of silver and of ivory, and bought them at a price as high as that of a slave. Till the time of Nero, however, they knew no other species than the Indian, when those who ministered to the pleasures of that extravagant and luxurious emperor found them in an island far up the river Nile, called Gaganda.

The Portuguese, who first doubled the Cape of Good Hope, found all the coast of Africa, and the islands of the Indian ocean, peopled with various tribes of parrots totally unknown in Europe, and in such vast numbers, that it was with difficulty they could be prevented from devouring the rice and maize. These, however, were far inferior to the numbers and variety that presented themselves to the first adventurers in the New World: some of the islands there were called the Parrot isles, from the prodigious quantity of these birds which flocked upon them. They constituted the first article of commerce, between the inhabitants of the Old and New Continents. In these regions every forest swarms with them; and the rook is not better known in Europe than the parrot in the East and West Indies.

The genus of parrots, which comprehends such infinite varieties, may easily be discriminated from every other tribe by the formation of the bill. The upper mandible, as well as the lower, in the whole race is moveable. It is not connected, and in one piece with the skull, as in most other birds, but is joined to the head by a strong membrane on each side, that lifts and depresses it at pleasure. By this contrivance, the bird can open its bill wider than it could otherwise do, and thus receive large nuts and fruits, which it can break with great facility.

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The toes of parrots display also a peculiar conformation : when walking, two are placed before, and one behind ; but when employed to carry food to the bill, one of the back toes is occasionally brought forward. Both the beak and claws of the parrot are used in climbing, an exercise in which the animal appears singularly awkward : the tongue somewhat resembles that of a man ; and it is from this circumstance, that some allege it is so well qualified to imitate the human speech. The formation of the throat, however, and the cavity of the beak, all contribute to its articulation, and to confer on it this distinguished privilege.

Parrots in their wild state feed on almost every kind of fruit and grain. Their flesh, it is said, always contracts the peculiar taste and flavour of the food they eat. At the season when the guava is ripe they are fat and tender, and some of the small tribes of the parrakeet are then sought after by the savages as delicate food. If they feed upon the seeds of the acajou, their flesh acquires the flavour of garlic ; when fed upon the seeds of the spicy trees, their flesh tastes of cloves and cinnamon. The seed of the cotton tree intoxicates them, as well as wine and the smoke of tobacco, which in taming, are often employed, to soften their fierceness and render them more talkative. Their appetite for flesh is unnatural, and when gratified, never fails to bring on diseases. Of all foods, they are fondest of the carthamus or bastard saffron ; which, though of a strongly purgative quality to man, agrees perfectly with their constitution, and will fatten the Guinea parrot very quickly.

Birds of this tribe are subject to disorders unknown to the rest of the feathered tribes ; many of them die of the epilepsy and the gout. They are, however, remarkable for longevity ; and there are some well-attested instances of their having lived from fifty to sixty years. From twenty to thirty years, however, may be considered as the common period which these birds live, when well kept : after which time the bill becomes generally so much hooked, that they are deprived of the power of taking food. They commonly breed in the hollow parts of old trees which have begun to rot, without forming a nest ; and sometimes availing themselves of the labours of the woodpecker, they seize upon the hole which it has industriously scooped out. The larger kinds lay only two eggs, but they bring forth twice in the year. The smaller kinds, which from their weakness are more exposed to devastation, are probably more prolific ; for nature constantly replenishes those species which are most easily destroyed, by conferring upon them a superior degree of fecundity.

As it is only when the parrots are taken young that they can be successfully tamed, the savages commonly take them while in the nest. They sometimes, however, catch them when full grown, for food, and for their feathers, which they convert into valuable articles of dress. For this purpose, they have various

contrivances. They sometimes mark the trees upon which they perch, and during night bring sulphureous substances, which they burn around them, and by the fumes of which the birds are suffocated, and fall to the ground. In some places they stun them with arrows wrapped at the point with cotton ; in others, they cut down the tree in which the nest is built. In New Spain, where the feathers constitute an article of regular commerce among the natives, they take possession of a number of trees where the parrots breed, and which they transmit as an inheritance from father to son.

Independently of the division of this numerous genus into those with long and those with short tails, Buffon and some other naturalists have separated them into those of the Old and those of the New Continent. The former have been subdivided into cockatoos, parrots, lories, and paroquets ; the latter into aras or maccaws, amazons, criks, popinjays, and paroquets. These sections differ chiefly in point of size, growing smaller in the order in which they are mentioned. We shall not puzzle the reader, by attempting to discriminate all these, but shall select for his notice a few of the most remarkable of each tribe.

1. *P. cristatus*. Yellow-crested cockatoo. White ; crest folding ; yellow ; bill and feet black ; a shade of yellow under the wings and tail. The yellow crest, which is of a beautiful citron, consists of a tuft of long soft feathers, which it can raise or depress at pleasure : it is that bird whose beauty and elegance Aldrovandus admires so much : its manners are gentle, and its temper docile ; and it is more distinguished by affection, when tame, than any of the tribe. The cockatoos are the largest parrots of the Old Continent. They are found in all the tropical regions of India, and in the islands of the Indian ocean ; where they are in some parts almost domestic, and build on the roofs of houses. The name cockatoo is given them from its resemblance to their cry. They abound in Bunda, Ceram, the Philippines, and the islands of Sunda. Eighteen inches long : crest five.

2. *P. aterrimus*. Black cockatoo. Black : crest large, paler ; cheeks red, naked. Of the cockatoos, the largest kind of parrots known, there are five species, which are all distinguished by a crest of feathers above the head, and, by the French naturalists are named according to the colour of their crests. The crest of the first is white ; that of the second, yellow, as described above ; that of the third, red ; that of the fourth, pale brown ; and that of the fifth, which is the present, deep brown approaching to black. The whole body of this bird is covered with a black plumage. Its bill and legs are nearly of the same colour ; so that it may be termed the negro of the cockatoos. Some naturalists have described it by the name of the Indian crow. Its length is more than a yard. It is found chiefly in New Holland.

3. *P. erythacus*. Hoary parrot, or jaco. Hoary : temples naked, white : tail cochineal. Several other varieties, from variety of colours.



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This parrot is most frequently imported into Europe at present; and when properly taught, it is a great adept in language. The name jaco, which it frequently pronounces, is commonly given it for that reason. The whole body is of a beautiful grey pearly colour; deep upon the back, but lighter below, and whitening towards the belly. The red vermilion tail is always powdered with a whiteness which preserves its gloss. The beak is black, the feet grey: the iris of a golden hue. The whole length of the bird is about twenty inches. Inhabits Guinea, and the interior parts of Africa. They have been imported into Jamaica, but are not indigenous in any part of the New World. They are not only endowed with the faculty of imitating the human voice, but apparently with a strong desire of speaking, which they manifest by their eagerly listening to catch sounds, and their constant efforts to repeat them. They seem to prescribe themselves tasks, in order to retain the lessons which are given them every day. Cardan absurdly ascribes this to emulation, and a desire of glory.

4. *P. garrulus*. Ceram, or scarlet lory. Red; orbits ash; cheeks and wings green; latter half of the tail-feathers blue. Three or four other varieties, from variety of colour. The name of lory has been given to one family of the parrots, from their frequently repeating this word. The tribe is but little distinguished from the rest, except in colour, which is red, more or less deeply shaded. They are the most spirited and gay of the whole race; qualities which they retain even in captivity. The scarlet lory, and the tribe in general, come from the Moluccas. They are held in such estimation in some parts of India, that they bring a considerable price. The Dutch were long unsuccessful in transporting this elegant species into Europe: they generally died in the passage; and it was with difficulty they brought one alive to Amsterdam, in their second voyage. They are now frequently seen, and are characterised by their attachment to their masters. In Java, the Indians rear vast numbers of them in a state of domestication; a practice which seems very old in the East.

5. *P. Guineensis*. Yellow-breasted lory. Head and neck scarlet; eye-brows and breast yellowish; wings yellow-green tipped with blue. Found chiefly in New Guinea, and in the Molucca isles. It is docile and familiar in its manners when tamed; but peculiarly delicate and difficult to rear. There is none of the whole tribe more easily taught to speak: on this account, as well as the beauty of its plumage, it is held in high estimation; and a single bird has been sold at twenty guineas. Ten inches long.

6. *P. Alexandri*. Alexandrine paroquet. Green; collar and crest red; chin black. Five or six other varieties, from variation in the colours, chiefly in the colour of the collar. The term paroquet has been applied to the smallest of the parrot tribes, whether in the

New or Old Continent. Buffon, who has endeavoured to enumerate the whole of this numerous and diversified race, has termed the small parrots of the Old World perruches, those of America perriches: the former he has subdivided into two sections, those with short, and those with long tails. In the first of these sections he enumerates and describes eighteen species, and in the second ten. These species, however, make but a small number compared with those of other ornithologists, or even with those he has himself enumerated as belonging to America.

The Alexandrine paroquet was the only parrot known, in the time of Pliny, to the ancient Romans. The whole plumage of this species is a brilliant green, except a semicircular band of bright red around the upper part of the neck. The minute description which Aldrovandus has given of the ancient parrot leaves no room to doubt that it is the individual now under review. It is found not only in the interior parts of the south of Asia, but likewise in the island of Ceylon: and it appears that it was from this island that the sailors of Alexander's fleet imported this bird into Greece, where none of the species had ever yet been beheld.

7. *P. Macao*. Red and blue maccaw. Red; quill feathers above blue, beneath rufous; feathers of the shoulders variegated blue and green; cheeks naked, wrinkled. Of all the parrot race, this is the grandest and most magnificently equipped. The purple, the gold, and the azure of his plumage, alternately dazzle the eye of the beholder. The steady assurance of his countenance, the majestic stateliness of his gait, which borders on disdain, seem to announce an inward consciousness of his superior beauty. Parrots of this species are confined to the continent and islands in the intratropical regions of the New World. None of them are to be found either in Africa or the East Indies.

When these parrots were first brought into Europe, their beautiful plumage and their large and majestic form created universal admiration. Aldrovandus first saw one of them at Mantua in 1572; and he observes, that they were at that time in all the estimation which rarity could give them. Princes gave and received them as the most valuable presents.

Columbus in his second voyage saw several of them as he touched at Guadaloupe. They are to be met with even on the desert islands; and they every where constitute the most beautiful ornament of those gloomy forests that darken the face of a country abandoned by men. While Anson and his officers were contemplating the grand scenes displayed by nature in these solitary abodes, a flight of maccaws passed above them; and, as if to heighten the magnificence of the spectacle, they made several windings through the air, displaying the vivid lustre of their plumage. There are four different species of the maccaw described by naturalists; the red, the blue, the green, and the

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black. The characters which distinguish them from the other families of this genus are, first, their size, which is nearly double that of any other species; and next, the length of the tail, which seems beyond even the proportion of their bodies; and lastly, the naked skin, of a dirty white, that covers their cheeks and the under parts of their head.

The red and blue maccaw is nearly three feet in length; the whole body, except the wings, is of a vermilion colour; the larger feathers of the wing are of a deep blue on the outside; on the inner, of a brown leather colour: the lesser feathers are of a blue and green, admirably blended together. The greater coverts of the wings are of a golden yellow terminating in green. On the first discovery of America, these birds, as indeed almost every other kind, were so remarkably tame, that they could almost be taken with the hand. The noise of a fowling piece did not much terrify them. This was also the case in the woods of New Zealand, when visited by captain Cook, where the birds suffered the approach of man with a kind of confidence and familiarity. The savages, few in number, and badly armed, had scarcely made them feel the dominion of the human race.

Birds of this species are found over all the southern parts of America, and the West Indies. They prefer moist and watery grounds, because in such the palm trees are most frequent, of the fruit of which they are passionately fond. They commonly go in pairs, seldom in flocks: sometimes, however, they assemble in the morning in much greater numbers, when they set up a loud and disagreeable chattering, which is heard at a great distance. They cry while on wing, as well as when they perch. Though excellent flyers, they seldom remove far from the place of their abode, except in quest of food; and, when that is obtained, they regularly return in the evening. There is a certain poisonous kind of fruit which they sometimes eat, that is said to communicate its noxious qualities to their flesh, and to render it dangerous to eat them. In Guiana and Brasil, where they are not obliged to take this species of food, they are eat by the natives with great safety.

All the aras, or large parrots, build their nests in the hollow of rotten trees, which, in their native country, are easily to be found; for there, a much greater number of trees fall merely from age than by the hands of the carpenter. When the tree is not fully rotten, and the hole not large enough for their reception, they widen it with their bills. The last process in finishing their house is the lining it with feathers.

The maccaw lays twice in the year, and generally two eggs at a time, about the size of a pigeon's.

The male and female maccaw share alternately in the labours of incubation, and rearing the young. They are equally assiduous in procuring them food; and, during the whole time

of their nonage, the nuptial tie remains unbroken, both parents guarding their offspring with unremitting care.

Maccaws, when young, are easily tamed, and therefore, in many parts of America, they are only caught at that age; because those who catch them are sensible, that all their labour in their education would, after such period, prove fruitless. Du Tertre mentions, however, a singular method of taking the old ones alive practised in the West Indies. The inhabitants watch the moment when they alight to eat the fruit that has fallen; they then surround them, and by clapping their hands and uttering loud shrieks, so alarm them, that, forgetting the use of their wings, they tumble upon their backs to defend themselves by their claws and beak. In the moment of surprise, the savages present to them a stick, which they seize with their claws, when they immediately lay hold of them. These facts, to say no more, appear suspicious, because it is certain these birds fly at the sight of a man; and if so, they will not certainly lie down to listen to his cries.

Another author affirms, that the Indians of the Isthmus of Panama tame maccaws as we tame pies, by allowing them some liberty by day, certain that they will return at night. But however good domestics, they are not adepts in speaking. The savages adorn themselves with their feathers, by drawing them through the cartilage of the nose. Of all game, these birds are most frequent. They make excellent soup, and are very frequently eat in Cayenne.

This species, perhaps, more than any other of the feathered race, is subject to epilepsy; a disorder which is more violent and fatal in warm than in temperate climates. The savages pretend to have found out a cure for this disease, which consists in cutting off the extremity of one of the bird's toes, and allowing the blood to flow.

To this disease the parrots that are kept in a domesticated state are more subject than the wild. The abstraction of the female, the superabundance of food, and the consequent excess of blood in the system, seem to be the causes of epilepsy among these birds.

8. *P. æstivus*, Amazon or common parrot. Green, slightly spotted with yellow; front blue; shoulders blood-red; orbits carnation. Eight or nine other varieties. This parrot is classed among those which are called amazons in America, because they came originally from Amazonia. The criks are nearly allied to the amazons; both are distinguished by the redness of their wings; the wings of the former are red on the top, those of the latter, nearer the body. The amazons are larger than the criks, and much more beautiful.

The body of this species is green, tending to a clay colour below. The feathers on the crown of the head are pale yellow; the cheeks and throat of a clay colour. The five middle feathers of the wing are red down to the middle. The rectrices, or tail feathers, are red in



the half next the body; in the other part, green, terminating in a clay colour.

Birds of this species build in the hollows of rotten trees, that have been prepared by the woodpecker. When their residence in a tree is once fixed, they do not, like other birds, readily abandon it, when their nest is discovered, or their eggs handled. In the season of procreation, they build in great numbers, in the same district, from which they issue in troops to procure food.

When satisfied with food, they begin a kind of loud loquacity, which they continue without interruption, hopping from branch to branch, till the darkness of night, and the fatigue of continual motion, compel them to rest. When the common parrots are taken young, their education is most successful: after they have arrived at their adult state, they can hardly be tamed to such a degree as to suffer themselves to be handled. The method fallen upon to tame them is by making them snuff the smoke of tobacco, which so intoxicates them, that they become gentle, languid, and inactive. As soon as their vicious habits begin to return, the dove is repeated; and the same treatment completely checks their noisy jargon.

The amazons and criks are, of all the American parrots, most easily taught to speak. The females have been alleged to be incapable of acquiring that art, but without any truth; for they are even more docile and gentle than the males.

9. *P. ochrocephalus*. Yellow-headed parrot. Head and throat are yellow: upper part of the body a shining green, lower yellow: distinguished from the amazons by the yellow tip of the wing. First row of the wing coverts red and yellow; the others a fine green: feathers of the tail and wings variegated with green, black, yellow, red, and violet.

This species belongs to the class called criks by the French writers. M. Bougot, a capuchin, has transmitted the following detail of the manners and habits of this bird to M. Buffon. "It shews itself," says he, "capable of attachment to its master; but its affection is always conditional, and in proportion to the caresses it receives; it is piqued by neglect, and vindictive if provoked. It falls into transports of anger, bites its enemy, then laughs aloud, as if applauding itself for the mischief it has done. Against harsh treatment and chastisement it constantly revolts, being always hardened and rendered more obstinate by severity.—An incessant habit of gnawing and tearing makes these birds destructive of every thing around them. Cloths, furniture, paper, and pens they take a pleasure in tearing and destroying; and you no sooner remove these articles to a different place, to put them out of their way, than they are there, merely from a principle of contradiction. These bad qualities, however, are compensated by others more agreeable: they easily retain what instructions are given them in speaking. Before they begin to articulate, they mount upon the beam of their cage, hang

their wings, and shake themselves. Confinement makes them pensive and silent; they are most talkative when at liberty, and in summer they chatter more copiously than in winter; it is then that their love of conversation seems to overcome their appetite for food.

"In these seasons of gaiety, they are affectionate, obedient, and attentive; they are fond to give and receive caresses; but their good humour is often interrupted by sudden gusts of anger and caprice. They seem to be affected by the changes of the weather; for by these they become silent and melancholy.

"This bird is fond of children; a circumstance in which he differs from other birds of the same genus: he prefers, however, some to others; and the favourite child has the privilege of taking hold of him and carrying him at pleasure. He caresses them; but did a grown person then venture to touch him, he would bite him most severely. When his young friends leave him, he shows evident symptoms of distress; follows them, and calls them back with a loud voice.

"The time of moulting is with this species a season of dejection and distress, which continues with little abatement for three months. Their ordinary food is nuts, fruit, and bread dipped in wine: they prefer flesh to grain, but it makes them heavy and indolent, and often causes them to throw their feathers. Their food is deposited for some time in a pouch or bag, from which it is afterwards taken to undergo rumination."

10. *P. Paradisi*. Paradise parrot. Next to the families of amazons and criks, is a tribe of popinjays, of which the parrot of paradise is a species. There are eleven species of the popinjays, which are all distinguished from the tribes above described, by having no red on their wings. This particular kind is very beautiful. The whole body is yellow, and all the feathers bordered with a sort of gilding. The larger feathers of the wing are white; the lateral feathers of the tail red about two thirds of their length, the rest yellow.

11. *P. aureus*. Golden-crowned parrot. The class of paroquets is extremely numerous and diversified. Of the species named golden-crowned by Mr. Edwards, an individual, in his time, remained fourteen years in England, and laid five or six small white eggs. Paroquets of this species assemble in very large flocks in Cayenne: when properly tamed, they are good speakers. These beautiful birds have a large spot of orange colour on their forehead; the rest of the head, the back, wings, and tail, are of a deep green. The throat and lower part of the belly yellow; on each wing a longitudinal stroke of fine blue.

PSOAS MAGNUS. (Loas, from *Loas*, the loin; because it is situated in the loins.) In anatomy, *psaos*, seu *lumbicus internus* of Winslow. This is a long, thick, and very considerable muscle, situated close to the fore part and sides of the lumbar vertebræ. It arises from the bodies of the last vertebra of the back, and

of all the lumbar vertebræ laterally, as well as from the anterior surfaces of their transverse processes, by distinct tendinous and fleshy slips, that are gradually collected into one mass, which becomes thicker as it descends, till it reaches the last of the lumbar vertebræ, where it grows narrower again, and, uniting at its outer and posterior edge, (where it begins to become tendinous) with the iliacus internus descends along with that muscle under the ligamentum fallopii, and goes to be inserted tendinous at the bottom of the trochanter minor of the os femoris, and fleshy into the bone a little below that process. Between the tendon of this muscle and the ischium, we find a considerable bursa mucosa. This muscle, at its origin, has some connection with the diaphragm, and likewise with the quadratus lumborum. It is one of the most powerful flexors of the thigh forwards, and may likewise assist in turning it outwards. When the inferior extremity is fixed, it may help to bend the body forwards, and in an erect posture, it greatly assists in preserving the equilibrium of the trunk upon the upper part of the thigh.

**PSOAS PARVUS.** This muscle, which was first described by Riolanus, is situated upon the *psaos magnus*, at the anterior part of the loins. The *psaos parvus* arises thin and fleshy from the side of the uppermost vertebra of the loins, and sometimes also from the lower edge of the last vertebra of the back, and from the transverse processes of each of these vertebræ; it then extends over part of the *psaos magnus*, and terminates in a thin flat tendon, which is inserted into that part of the brim of the pelvis where the os pubis joins the ilium. From this tendon a great number of fibres are sent off, which form a thin fascia, that covers part of the *psaos magnus* and *iliacus internus*, and gradually loses itself on the fore part of the thigh. In the human body, this muscle is very often wanting; but in a dog, according to Douglas, it is never deficient. Riolanus was of opinion, that it occurs oftener in men than in women; Winslow asserts just the contrary; but the truth seems to be, that it is as often wanting in one sex as in the other. Its use seems to be to assist the *psaos magnus* in bending the loins forward; and when we are lying upon our back, it may help to raise the pelvis.

**PSOPHIA.** Trumpeter. In zoology, a genus of the class aves, order grallæ. Bill cylindrical, conic, convex, somewhat pointed, the upper mandible longer; nostrils oval, pervious; tongue cartilaginous, flat, fringed at the tip; feet four-toed, cleft. Two species.

1. *P. crepitans*. Cold-breasted trumpeter. Black; back grey; breast shining blue-green; orbits naked, red; bill yellowish-green; legs strong, tall, brownish ash or green; beneath the back toe a short protuberance, a little distance from the ground; tail very short; feathers of the head downy, of the lower part of the neck squamiform, of the shoulders ferruginous, lax, pendulous, silky; scapulars long,

pendent. Inhabits Brasil and Guinea. Twenty inches long; emits from the lungs a harsh, uncommon noise, not unlike a child's trumpet, and follows people through the streets persecuting them with its disagreeable cry, so that it is difficult to get rid of them; stands on one leg, and sleeps with its neck drawn in between the shoulders; eggs blue-green.

2. *P. undulata*. Undulate trumpeter. Crest of the hind-head short, whitish; of the breast long, black, pendent; head brown with black spots; body above brown waved with black, beneath blueish-white; breast and belly with a few black spots; on each side of the neck a black stripe, widening as it descends, and meeting on the lower part before. Inhabits Africa: size of a goose. See Nat. Hist. Pl. CLXI.

**PSORA.** (*Ψωρα*, the itch.) The itch. A genus of disease in the class locales and order dialyses of Cullen: appearing first on the wrists and between the fingers in small pustules with watery heads. It is contagious.

**PSORALEA.** in botany, a genus of the class diadelphia, order decandria. Calyx as long as the legume; stamens with one of the filaments separate; legume one-seeded, slightly-beaked, valveless. Twenty-nine species, mostly Cape plants. The following are cultivated chiefly:

1. *P. pinnata*. Wing-leaved psoralea. Stem woody, branching out five or six feet high; leaves pinnate in two pairs, linear; peduncles one-flowered; flowers sessile, blue with white heels. Cape.

2. *P. aculeata*. Prickly psoralea. Stem shrubby, branchy, three or four feet high; leaves ternate; leaflets wedge-form with recurved points; flowers axillary, solitary, close together, of a blue colour. Cape.

3. *P. bituminosa*. Bituminous psoralea. Stalk shrubby, few branches; about three or four feet high; leaves ternate; spikes in heads, axillary, peduncled; flowers blue. Italy, Sicily.

The following are also cultivated:

4. *P. bracteata*. Oval-spiked psoralea.

5. *P. hirta*. Hairy psoralea.

6. *P. americana*. American psoralea.

7. *P. corilifera*. Hazel-nut-leaved psoralea.

8. *P. dalea*. Annual psoralea.

These are all increased by sowing their seeds in the early spring months on a moderate hot-bed, or in pots plunged into it. They may also be increased by planting cuttings of the young shoots, in summer, in pots filled with light earth plunged into a hot-bed, and covered with glasses.

**PSORIASIS.** (*Ψωρίασις*, from *Ψωρα*, to itch.) The disease to which Dr. Willan gives this title is characterized by a rough and scaly state of the cuticle, sometimes continuous, sometimes in separate patches, of various sizes, but of an irregular figure, and for the most part accompanied with rhagades or fissures of the skin. From the lepra it may be distinguished, not only by the distribution of the patches, but



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also by its cessation and recurrence at certain seasons of the year, and by the disorder of the constitution with which it is usually attended. Dr. Willan gives the following varieties: *Psoriasis guttata*,—*diffusa*,—*gyrata*,—*palmaria*,—*labialis*,—*infantilis*,—*inveterata*.

*Psoriasis guttata*. This complaint appears in small, distinct, but irregular patches of laminated scales, with little or no inflammation round them. The patches very seldom extend to the size of a sixpence. They have neither an elevated border, nor the oval or circular form by which all the varieties of lepra are distinguished; but their circumference is sometimes angular, and sometimes goes into small serpentine processes. The scale formed upon each of them is thin, and may be easily detached, leaving a red, shining base. The patches are often distributed over the greatest part of the body, but more particularly on the back part of the neck, the breast, arms, loins, thighs, and legs. They appear also upon the face, which rarely happens in lepra. In that situation they are red and more rough than the adjoining cuticle, but not covered with scales. The *psoriasis guttata* often appears on children in a sudden eruption, attended with a slight disorder of the constitution, and spreads over the body within two or three days. In adults it commences with a few scaly patches on the extremities, proceeds very gradually, and has a longer duration than in children. Its first occurrence is usually in the spring season, after violent pains in the head, stomach, and limbs. During the summer it disappears spontaneously, or may be soon removed by proper applications, but is apt to return again early in the ensuing spring, and continues so to do for several successive years. When the scales have been removed, and the disease is about to go off, the small patches have a shining appearance, and they exhibit a dark red intermixed with somewhat of a bluish colour for many days or even weeks before the skin is restored to its usual state. In the venereal disease there is an eruption which very much resembles the *psoriasis guttata*, the only difference being a slight degree of scalliness, and a different shade of colour in the patches, approaching to a livid red, or very dark rose colour. The patches vary in their extent, from the section of a pea, to the size of a silver penny, but are not exactly circular. They rise at first very little, if at all, above the cuticle. As soon, however, as the scales appear on them, they become sensibly elevated; and sometimes the edge or circumference of the patch is higher than the little scales in its centre. This eruption is usually seen upon the forehead, breast, between the shoulders, or in the inside of the fore-arms, in the groins, about the inside of the thighs, and upon the skin covering the lower part of the abdomen. The syphilitic *psoriasis guttata* is attended with, or soon followed by, an ulceration of the throat. It appears about six or eight weeks after a chancre has been healed by an ineffectual course of mercury. A similar appearance takes place at nearly the same pe-

riod, in some cases where no local symptoms had been noticed. When a venereal sore is in a discharging state, this eruption, or other secondary symptoms, often appear much later than the period above mentioned. They may also be kept back three months, or even longer, by an inefficient application of mercury. If no medicines be employed, the syphilitic form of the *psoriasis guttata* will proceed during several months, the number of the spots increasing, and their bulk being somewhat enlarged, but without any other material alteration.

The *psoriasis diffusa* spreads into large patches, irregularly circumscribed, reddish, rough, and chappy, with scales interspersed. It commences, in general, with numerous minute asperities, or elevations of the cuticle, more perceptible by the touch than by sight. Upon these, small distinct scales are soon after formed, adhering by a dark central point, while their edges may be seen white and detached. In the course of two or three weeks all the intervening cuticle becomes rough and chappy, appears red, and raised, and wrinkled, the lines of the skin sinking into deep furrows. The scales which form among them are often slight, and repeatedly exfoliate. Sometimes, without any previous eruption of papulæ, a large portion of the skin becomes dry, harsh, cracked, reddish, and scaly, as above described. In other cases, the disorder commences with separate patches of an uncertain form and size, some of them being small, like those in the *psoriasis guttata*, some much larger. The patches gradually expand till they become confluent, and nearly cover the part or limb affected. Both the *psoriasis guttata* and *diffusa* likewise occur as a sequel of the lichen simplex. This transition takes place more certainly after frequent returns of the lichen. The parts most affected by *psoriasis diffusa* are the cheeks, chin, upper eye-lids, and corners of the eyes, the temples, the external ear, the neck, the fleshy parts of the lower extremities, and the fore-arm, from the elbow to the back of the hand, along the supinator muscle of the radius. The fingers are sometimes nearly surrounded with a loose scaly incrustation; the nails crack and exfoliate superficially. The scaly patches likewise appear, though less frequently, on the forehead and scalp, on the shoulders, back, and loins, on the abdomen, and instep. This disease occasionally extends to all the parts above-mentioned at the same time; but, in general, it affects them successively, leaving one place free, and appearing in others; sometimes, again, returning to its first situation. The *psoriasis diffusa* is attended with a sensation of heat, and with a very troublesome itching, especially at night. It exhibits small, slight, distinct scales, having less disposition than the lepra to form thick crusts. The chaps or fissures of the skin, which usually makes a part of this complaint, are very sore and painful, but seldom discharge any fluid. When the scales are removed, by frequent washing,

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or by the application of unguents, the surface, though raised and uneven, appears smooth and shining; and the deep furrows of the cuticle are lined by a slight scalliness. Should any portion of the diseased surface be forcibly excoriated, there issues out a thin lymph, mixed with some drops of blood, which slightly stains and stiffens the linen, but soon concretes into a thin dry scab; this is again succeeded by a white scalliness, gradually increasing, and spreading in various directions. As the complaint declines, the roughness, chaps, scales, &c. disappear, and a new cuticle is formed, at first red, dry, and shrivelled, but which, in two or three weeks, acquires the proper texture. The duration of the psoriasis diffusa is from one to four months. If, in some constitutions, it does not then disappear, but becomes, to a certain degree, permanent, there is at least an aggravation or extension of it, about the usual period of its return. In other cases, the disease, at the vernal returns, differs much as to its extent, and also with respect to the violence of the preceding symptoms. The eruption is, indeed, often confined to a single scaly patch, red, itching, and chapped, of a moderate size, but irregularly circumscribed. This solitary patch is sometimes situated on the temple, or upper part of the cheek, frequently on the breast, the calf of the leg, about the wrist, or within, and a little below the elbow joint, but especially at the lower part of the thigh, behind. It continues in any of these situations several months without much observable alteration. The complaint denominated with us the bakers itch is an appearance of the psoriasis diffusa on the back of the hand, commencing with one or two small, rough, scaly patches, and finally extending from the knuckles to the wrist. The rhagades, or chaps and fissures of the skin, are numerous about the knuckles and ball of the thumb, and where the back of the hand joins the wrist. They are often highly inflamed, and painful, but have no discharge of fluid from them. The back of the hand is a little raised or tumefied, and, at an advanced period of the disorder, exhibits a reddish, glossy surface, without crusts or numerous scales. However, the deep furrows of the cuticle are, for the most part, whitened by a slight scalliness. This complaint is not general among bakers; that it is only aggravated by their business, and affects those who are otherwise disposed to it, may be concluded from the following circumstances: 1. It disappears about midsummer, and returns in the cold weather about the beginning of the year: 2. Persons constantly engaged in the business, after having been once affected with the eruption, sometimes enjoy a respite from it for three or four years: 3. When the business is discontinued, the complaint does not immediately cease. The grocers itch has some affinity with the bakers itch, or tetter; but, being usually a pustular disease at its commencement, it properly belongs to another genus. Washerwomen, probably from the irritation of soap, are liable to be affected

with similar scaly disease on the hands and arms, sometimes on the face and neck, which, in particular constitutions, prove very troublesome, and of long duration.

The *psoriasis gyrata* is distributed in narrow patches or stripes, variously figured; some of them are nearly longitudinal; some circular, or semicircular with vermiciform appendages; some are tortuous, or serpentine; others like earth-worms or leeches; the furrows of the cuticle, being deeper than usual, make the resemblance more striking, by giving to them an annulated appearance. There is a separation of slight scales from the diseased surface, but no thick incrustations are formed. The uniform disposition of these patches is singular; I have seen a large circular one situated on each breast above the papilla; and two or three others of a serpentine form, in analogous situations along the sides of the chest. The back is often variegated in like manner, with convoluted tetter, similarly arranged on each side of the spine. They likewise appear, in some cases, on the arms and thighs, intersecting each other in various directions. A slighter kind of this complaint affects delicate young women and children in small scaly circles or rings, little discoloured; they appear on the cheeks, neck, or upper part of the breast, and are mostly confounded with the herpetic, or pustular ring-worm. The *psoriasis gyrata* has its remissions and returns, like the *psoriasis diffusa*; it also exhibits, in some cases, patches of the latter disorder on the face, scalp, or extremities, while the trunk of the body is chequered with the singular figures above described.

*Psoriasis palmaria.* One very obstinate species of tetter is nearly confined to the palm of the hand. It commences with a small, harsh, or scaly patch, which gradually spreads over the whole palm, and sometimes appears in a slighter degree on the inside of the fingers and wrist. The surface feels rough from the detached and raised edges of the scaly laminae; its colour often changes to brown, or black, as if dirty; yet the most diligent washing produces no favourable effect. The cuticular furrows are deep, and cleft at the bottom longitudinally, in various places, so as to bleed on stretching the fingers. A sensation of heat, pain, and stiffness, in the motions of the hand, attends this complaint. It is worst in winter or spring, and occasionally disappears in autumn or summer, leaving a soft dark-red cuticle; but many persons are troubled with it for a series of years, experiencing only very slight remissions. Every return or aggravation of it is preceded by an increase of heat and dryness, with intolerable itching. Shoemakers have the *psoriasis palmaria* locally, from the irritation of the wax they so constantly employ. In braziers, tinmen, silversmiths, &c. the complaint seems to be produced by handling cold metals. A long predisposition to it from a weak, languid, hectic state of the constitution may give effect to different occasional causes. Dr. Willan has observed it in women after lying-in; in some



persons it is connected, or alternates with arthritic complaints. When the palms of the hands are affected as above stated, a similar appearance often takes place on the soles of the feet; but with the exception of rhagades, or fissures, which seem less liable to form there, the feet being usually kept warm and covered. Sometimes, also, the psoriasis palmaria is attended with a thickness of the præputium, with scaliness, and painful cracks. These symptoms at last produce a phymosis, and render connubial intercourse difficult, or impracticable; so great, in some cases, is the obstinacy of them, that remedies are of no avail, and the patient can only be relieved by circumcision. This affection of the præputium is not exactly similar to the venereal appearance; but rhagades or fissures, and indurated patches within the palm of the hand, take place in syphilis, and somewhat resemble the psoriasis palmaria. The venereal patches are, however, distinct, white, and elevated, having nearly the consistence of a soft corn. From the rhagades, there is a slight discharge, very offensive to the smell. The soles of the feet are likewise, in this case, affected with the patches, not with rhagades. When the disease yields to the operation of mercury, the indurated portions of cuticle separate, and a smooth new cuticle is found formed underneath. The fingers and toes are not affected with the patches, &c. in venereal cases.

*Psoriasis labialis.* The psoriasis sometimes affects the prolabium without appearing on any other part of the body. Its characteristics are, as usual, scaliness, intermixed with chaps and fissures of the skin. The scales are of a considerable magnitude, so that their edges are often loose, while the central points are attached, a new cuticle gradually forms beneath the scales, but is not durable. In the course of a few hours it becomes dry, shrivelled, and broken; and, while it exfoliates, gives way to another layer of tender cuticle, which soon, in like manner, perishes. These appearances should be distinguished from the slight chaps and roughness of the lips produced by very cold or frosty weather, but easily removed. The psoriasis labialis may be a little aggravated by frost or sharp winds, yet it receives no material alleviation from an opposite temperature. It is not, indeed, confined within any certain limit, or period of duration, having, in several instances, been protracted through all the seasons. The under lip is always more affected than the upper, and the disease takes place more especially in those persons whose lips are full and prominent.

*Psoriasis scrotalis.* The skin of the scrotum may be affected in the psoriasis diffusa like other parts of the surface of the body; but sometimes a roughness and scaliness of the scrotum appears as an independent complaint, attended with much heat, itching, tension, and redness. The above symptoms are succeeded by a hard, thickened, brittle texture of the skin, and by painful chaps or excoriations, which are not easy to be healed. This complaint is sometimes produced

under the same circumstances as the prurigo scroti, and appears to be in some cases a sequel of it. A species of the psoriasis scrotalis likewise occurs in the lues venerea, but merits no particular attention, being always combined with other secondary symptoms of the disease.

*Psoriasis infantilis.* Infants, between the ages of two months and two years, are occasionally subject to the dry tetter. Irregular, scaly patches, of various sizes, appear on the cheeks, chin, breast, back, nates, and thighs. They are sometimes red, and a little rough, or elevated; sometimes excoriated, then again covered with a thin incrustation; and lastly, intersected by chaps or fissures. The general appearances nearly coincide with those of the psoriasis diffusa; but there are several peculiarities in the tetter of infants which require a distinct consideration.

The *psoriasis inveterata* is characterized by an almost universal scaliness, with a harsh, dry, and thickened state of the skin. It commences from a few irregular, though distinct patches on the extremities. Others appear afterwards on different parts, and, becoming confluent, spread at length over all the surface of the body, except a part of the face, or sometimes the palms of the hands, and soles of the feet. The skin is red, deeply furrowed, or wrinkled, stiff and rigid, so as somewhat to impede the motion of the muscles, and of the joints. So quick, likewise, is the production and separation of scales, that large quantities of them are found in the bed on which a person affected with this disease has slept. They fall off in the same proportion by day, and being confined within the linen, excite a troublesome and perpetual itching.

**PSOROPHTHALMIA.** (Ψωροφθαλμία, from ψωρο, a scab, and οφθαλμος, an eye.) A scabby eruption, or itch-like pustules of the eyelids and their margins. The proximate cause is an acrimony deposited in the glands of the eye-lids. The species of the psorophthalmia are, 1. Psorophthalmia crustosa, which forms dry or humid crusts in the margins of the eye-lids. 2. Psorophthalmia herpetica, in which small papulae, itching extremely, and terminating in scurf, are observed.

**PSYCHE**, a nymph whom Cupid married and carried into a place of bliss. Venus put her to death because she had robbed the world of her son; but Jupiter, at the request of Cupid, granted immortality to Psyche. The word signifies the soul, and Psyche personified is generally represented with the wings of a butterfly, to intimate the lightness of the soul, of which the butterfly is the symbol.

**PSYCOTRIA**, in botany, a genus of the class pentandria, order monogynia. Calyx five-toothed, crowning the berry; corol tubular, berry globular; seeds two, hæmispherical, grooved on the convex side. Thirty-nine species; herbs, shrubs, and trees, of both the Indies and South America.

Of these, *P. emetria* is said to furnish the root known by the name of ipecacuanha in the

shops. A North American plant, herbaceous, procumbent; root perpendicular, wrinkled, slightly branched; leaves lanceolate, glabrous, approximate, opposite, pointed, with a round prominent rib underneath; stipules extrafoliaceous, subulate; heads axillary, peduncled, few-flowered; flowers white, small, sessile.

There is, however, some doubt as to the plant which furnishes the ipecacuanha; for Schoeber has of late asserted it to be the root of a plant which he denominates *callicocca* of Jussieu's order rubiacæ; while others assert one kind, at least, of ipecacuanha to be a *VIOLA*: which see.

**PSYDRACIÆ.** (*ψυδρακία*, from *ψυχος*, cold.) Red and somewhat elevated spots, which soon form broad and superficial vesicles, such as those produced by the stinging nettle, the bites of insects, &c. See **PUSTULE**.

**PSYLLIUM.** (*ψύλλιον*, from *ψύλλος*, a flea; so called because it was thought to destroy fleas.) *Pulicaris herba*. Flea-wort. The seeds of this plant, *plantago psyllium*; caule ramoso herbaceo; foliis subdentatis, recurvatis; capitulis aphyllis of Linnéus, have a nauseous mucilaginous taste, and no remarkable smell. The decoction of the seeds is recommended in hoarseness and asperity of the fauces.

**PTARMICA.** (*πταρμικά*, from *πτειρω*, to sneeze; so called because it irritates the nose, and provokes sneezing.) *Pseudopyrethrum*. *Pyrethrum sylvestre*: *Draco sylvestris*. *Tarchon sylvestris*. *Sternutamentoria*. Sneeze-wort. *Bastard pellitory*. *Achillea ptarmica*; foliis lanceolatis, acuminatis, argute serratis of Linnéus. The flowers and roots of this plant have a hot biting taste, approaching to that of pyrethrum, with which they also agree in their pharmaceutical properties. Their principal use is as a masticatory and sternutatory.

**PTARMIGAN**, in ornithology. See **TE-TRAO**.

**PTELEA**, in botany, a genus of the class tetrandria, order monogynia. Corol four-petalled; calyx four-parted, inferior; stigmas two; fruit with a roundish membrane containing a single seed in the middle.

One species only, *P. nifolea*. Three-leaved ptelea, or shrubby trefoil. Stem upright, woody, ten or twelve feet high; leaves in fives; flowers cymed; polygamous or diceious, of a white hue. It is cultivated by seeds, cuttings, or layers: and has a good effect in shrubberies, or other groups in pleasure-grounds.

**PTERIS**, in botany, a genus of the class cryptogamia, order filices. Fructification in a continued marginal line; involucre from the inflated membranaceous margin of the frond, continued, opening towards the rib. Forty-five species. They may be thus subdivided into sections:

- A. *Pteris* proper.
  - a. Frond simple.
  - b. Frond pinnate.
  - γ. Frond doubly pinnatifid and doubly pinnate.
  - δ. Frond more than decomposed.
- B. *Adiantum*-shaped; with the fructifications

of pteris, and a brown stalk. The root is viscid, nauseous, and bitterish; and like ferns in general has a salt mucilaginous taste. The powder of it is like that of the filix mas, is in some places used as a vermifuge, and in others as an excellent remedy in rachitis. Upon a larger scale it is often employed in its ashes as a manure, or as a substitute for soap.

**PTEROCARPUS**, in botany, a genus of the class diadelphia, order decandria. Calyx five-toothed; legume falcate, foliaceous, varicose, surrounded with a wing, not opening; seeds few, solitary. Seven species; natives of the Indies or South America. The following are the chief:

1. *P. draco*. Dragon's-blood tree. A tree thirty feet high, with a solid white wood; the bark when cut transversely yielding a blood-red resin, which is the dragon's-blood of the shops; a native of the West Indies.

2. *P. marsupium*. Tree with an orange-coloured wood, and white flowers; a native of Coromandel.

3. *P. santalinus*. Red saunders wood. Tree with a deep red wood; leaves ternate, roundish, retuse, quite glabrous, petals crenate, undulate, yellow with red veins.

There is some reason to believe that several red woods, capable of communicating this colour to spirituous liquors, are sold as red saunders; but the true officinal kind appears, on the best authority, to be of this tree, which is extremely hard, of a bright garnet red colour, and bears a fine polish. It is only the inner substance of the wood that is used as a colouring matter, and the more florid red is mostly esteemed. On being cut it is said to manifest a fragrant odour, which is more especially in old trees. According to Lewis, this wood is of a dull red, almost blackish colour on the outside, and a deep brighter red within; its fibres are now and then curled, as in knots. It has no manifest smell, and little or no taste; even of extracts made from it with water, or with spirit, the taste is considerable.

To watery liquors it communicates only a yellowish tinge, but to rectified spirit a fine deep red. A small quantity of an extract made with this menstruum, tinges a large one of fresh spirit of the same colour; though it does not, like most other resinous bodies, dissolve in expressed oils. Of distilled oils, there are some, as that of lavender, which receive a red tincture from the wood itself, and from its resinous extract, but the greater number do not. Red saunders has been esteemed as a medicine; but its only use attaches to its colouring property. The juice of this tree, like that of *P. draco*, affords a species of dragon's blood.

**PTEROCOCEUS.** See **CALLIGONUM**.

**PTEROGONIUM**, in botany, a genus of the class cryptogamia, order musci. Capsule oblong; fringe simple, of sixteen or thirty-two linear, erect, undivided teeth; flowers lateral. Nine species; three of them mosses of our own country.

**PTERONIA**, in botany, a genus of the



class syngenesia, order polygamia æqualis. Receptacle clothed with many-parted chaff; down somewhat feathery; calyx imbricate, with the scales carinate. Twenty-seven species; shrubs of the Cape.

**PTEROPHORUS**, in the entomology of Fabricius, a tribe of the genus *PHALÆNA*, which see.

**PTEROSPERMUM**, in botany, a genus of the class monadelphia; order decandria. Calyx single, five-parted; petals five; stamens twenty, five of them barren; style cylindrical; stigma thickish; capsule woody, five-celled; seeds mingled. Two species; natives of India: one a tree with ferruginous downy branchlets; the other a tree with white woolly bark; leaves white, woolly underneath; flowers white, terminal. The wood of both hard, and very like that of the holly-tree.

**PTEROTRACHIA**, in zoology, a genus of the class vermes, order mollusca. Body detached, gelatinous, with a moveable fin at the abdomen or tail; eyes two, placed within the head. Four species; the residence of one or two unknown, the rest found in the Mediterranean and Archipelago.

**PTERYGIUM**. (*πτερυγιον*, *πτερυξ*, a wing.) A membranous excrescence which grows upon the internal canthus of the eye chiefly, and expands itself over the albuginea and cornea towards the pupil. It appears to be an extension or prolongation of the fibres and vessels of the *caruncula lachrymalis*, or semilunar membrane, appearing like a wing. The species of pterygium are four: 1. *Pterygium tenue*, seu *ungula*, is a pellucid pellicle, thin, of a cineritious colour, and unpainful; growing out from the *caruncula lacrymalis*, or *membrana semilunaris*. 2. *Pterygium crassum*, seu *pannus*, differs from the *ungula* by its thickness, red colour, and fulness of the red vessels on the white of the eye, and it stretches over the cornea like fasciculi of vessels. 3. *Pterygium malignum*, is a pannus of various colours, painful, various, and arising from a cancerous acrimony. 4. *Pterygium pingue*, seu *pinguicula*, is a mollicle-like lard or fat, soft, without pain, and of a light yellow colour, which commonly is situated in the external angle of the eye, and rarely extends to the cornea; but often remains through life.

**PTERYGO**. In anatomy. Names compounded of this word belong to muscles which are connected with the pterygoid or wing-like process of the sphæmoid bone; as, *pterygo-pharyngeus*, &c.

**P. PHARYNGEUS**. See **CONSTRUCTOR PHARYNGIS SUPERIOR**.

**P. STAPHILINUS EXTERNUS**. See **LEVATOR PALATI**.

**PTERYGOIDEUS EXTERNUS**. (from *πτερυξ*, a wing, from its belonging to the processes pterygoides.) *Pterygoideus minor* of Winslow. It is placed, as it were, horizontally along the basis of the skull, between the pterygoid process and the condyle of the lower jaw. It usually arises by two distinct heads; one of which is thick, tendinous, and fleshy, from the outer wing of the pterygoid process of the os

sphenoides, and from a small part of the os maxillare adjoining to it; the other is thin and fleshy, from a ridge in the temporal process of the sphenoid bone, just behind the slit that transmits the vessels to the eye. Sometimes this latter origin is wanting, and, in that case, part of the temporal muscle arises from this ridge. Now and then it affords a common origin to both these muscles. From these origins the muscle forms a strong fleshy belly, which descends almost transversely outwards and backwards, and is inserted tendinous and fleshy into a depression in the fore part of the condyloid process of the lower jaw, and into the anterior surface of the capsular ligament that surrounds the articulation of that bone. All that part of this muscle, which is not hid by the *pterygoideus internus*, is covered by a ligamentous expansion, which is broader than that belonging to the *pterygoideus internus*, and originates from the inner edge of the glenoid cavity of the lower jaw, immediately before the styloid process of the temporal bone, and extends obliquely downwards, forwards, and outwards to the inner surface of the angle of the jaw. When these muscles act together, they bring the jaw horizontally forwards. When they act singly, the jaw is moved forwards and to the opposite side. The fibres that are inserted into the capsular ligament serve likewise to bring the moveable cartilage forwards.

**PTERYGOIDEUS INTERNUS**. *Pterygoideus major* of Winslow. It arises tendinous and fleshy from the whole inner surface of the external ala of the pterygoid process, filling all the space between the two wings; and from that process of the os palati that makes part of the pterygoid fossa. From thence the muscle growing larger, descends obliquely downwards, forwards, and outwards, and is inserted by tendinous and fleshy fibres, into the inside of the lower jaw, near its angle. This muscle covers a great part of the *pterygoideus externus*; and along its posterior edge we observe a ligamentous band, which extends from the back part of the styloid process to the bottom of the angle of the lower jaw. The use of this muscle is to raise the lower jaw, and to pull it a little to one side.

**PTERYGOIDEUS MAJOR**. See **PTERYGOIDEUS INTERNUS**.

**PTERYGOIDEUS MINOR**. See **PTERYGOIDEUS EXTERNUS**.

**PTERYGOID PROCESS**. (from *πτερυξ*, a wing, and *ειδος*, resemblance.) A wing-like process of the sphæmoid bone.

**PTILINUS**, in the entomology of Fabricius, a tribe of the coleopterous genus *HISPA*, which see.

**PTILOISIS**. (*πιλοσις*, from *πιλος*, bald.) A synonym of *madarosis*. See **MADAROSIS**.

**PTINUS**, in zoology, a genus of the class insecta, order coleoptera. Antennas filiform, the last joints larger; thorax nearly round, not margined, receiving the head. Thirty-nine species; a few African or American, the rest European; six or seven, inhabitants of our own country. They are thus subdivided into sections.

A. Feelers clavate; lip entire; constituting the anobium tribe of Fabricius.

B. Feelers filiform; lip bifid; the ptinus of Fabricius.

The following are chiefly worthy of notice:

1. *P. pulsator*. Death-watch. Subvillous, dusky, with irregular, grey, brown spots. Inhabits our own country and Europe generally in old wooden furniture; makes a peculiar ticking with the fore-part of its head, resembling a beating with the nail upon a table; this is done in seven, nine, or eleven distinct strokes in the night-time, and has been considered by vulgar superstition as forerunning some fatal occurrence in the family; it is nothing more, however, than the call of one sex to the other. A quarter of an inch long. There are one or two other insects that make a similar noise, and especially the tick-watch or *termes pulsatorius* with which the death-watch is often confounded. See **TERMES**.

2. *P. pertinax*. Brown, immaculate; thorax compressed. Inhabits Europe, and is very destructive to wooden furniture, and to books; when touched draws in its head and legs, and becomes immovable; is destroyed by the *attelabus fermicarius*.

3. *P. fur*. Testaceous; thorax four-toothed; shells with two white bands. Inhabits Europe, and is exceedingly destructive to museums, books, furniture, preserved subjects of natural history, and dried seeds. Larve six-footed, fat, soft, hairy, ferruginous, the dorsal segments a little prominent, pupa contained in a glutinous follicle; female wingless. See *Nat. Hist.* Pl. CLXVI.

**PTISAN** is properly barley decorticated, or deprived of its hulls by beating in a mortar, as was the ancient practice. Though the cooling potion obtained by boiling such barley in water, and afterwards sweetening the liquor with liquorice root, is what at present goes by the name of ptisan; and to render it laxative, some add a little sena or other ingredient of the same intention.

**PTOLEMAIC SYSTEM OF ASTRONOMY**, is that invented by Claudius Ptolemaeus. See **PTOLEMY** (Claudius).

**PTOLEMAIS**, (anc. geog.) the port of Arsinoe, situated on the west branch of the Nile, which concurs to form the island called Nomos Heracleotes, to the south of the vertex of the Delta.

**PTOLEMAIS** (Strabo), the largest and most considerable town of Thebais or Higher Egypt, and in nothing short of Memphis; governed in the manner of a Greek republic; situated on the west side of the Nile, almost opposite to Coptos. This town, which was built by Ptolemy Philadelphus, is now known by the name of Ptolemeta. The walls and gates are still entire, and there are a vast number of Greek inscriptions, but only a few columns of the portico remain. There is likewise an Ionic temple, done in the most ancient manner of executing that order, of which Mr. Bruce took a drawing, which is preserved in the king's collection. Another of Cyrenaica, anciently called Barce.—A third of

the Troglodytica, surnamed Epitheras, from the chase of wild beasts, as elephants: lying in the same parallel with Meroë (Strabo); on the Arabian gulf (Pliny); 4820 stadia to the south of Berenice.—A fourth of Galilee, anciently called Aca, or Acon; made a Roman colony under the emperor Claudius (Pliny).—A fifth of Pamphilia; situated near the river Melas, on the borders of Cilicia Aspera.

**PTOLEMY**. This name was common to 13 kings of Egypt, to enter into a minute detail of whose history would exceed the bounds allotted to this repository. They succeeded in the following order: Ptolemy the 1st, surnamed Lagus, was son of Arsinoe, who, when pregnant by Philip of Macedonia, married Lagus, a man of mean extraction. (See **LAGUS**.) Being educated in the court of Macedonia, he became one of the friends of Alexander, and attended him as one of his generals. During the Asiatic expedition he behaved with uncommon valour. After the conqueror's death, Ptolemy obtained the government of Egypt with Libya and part of the neighbouring territories of Arabia. In this appointment he gained the esteem of the people by his benevolence and clemency. Though much engaged in military operations, he, however, was not forgetful of literature. In order that his subjects might be acquainted with literature, he laid the foundation of a library, which, under the succeeding reigns, became the most celebrated in the world. Ptolemy died in the 84th year of his age, after a reign of 39 years, about 284 years before Christ. He was called Soter, from his giving assistance to the Rhodians against Demetrius and Antigonus, and all his successors were called Ptolemies from him.—The 2d, son of Ptolemy the first, succeeded his father upon the Egyptian throne, and was called Philadelphus, by Antiphrasis, because he killed two of his brothers. He shewed himself worthy in every respect to succeed his great father, and died in the 64th year of his age, 246 years before the Christian era. He left two sons and a daughter, by Arsinoe, the daughter of Lysimachus. During the whole of his reign Philadelphus was employed in exciting industry, and in encouraging the liberal arts and useful knowledge among his subjects. His palace was the asylum of learned men, whom he admired and patronized. It is said that the Old Testament was translated into Greek during his reign, a translation which has been called Septuagint, because translated by the labours of 70 different persons.—The 3d, succeeded his father Philadelphus on the Egyptian throne. The Egyptians called him Evergetes, for his beneficence and religious zeal in rescuing above 23,000 statues of the Egyptian gods carried off into Persia by Cambyzes, when he conquered Egypt. Evergetes died 221 years before Christ, after a reign of 25 years, and, like his two illustrious predecessors, he was a liberal patron of learning. It is said that he deposited 15 talents in the hands of the Athenians to be permitted to translate the original manuscripts of Æschylus, Euripides, and Sophocles.—The 4th, succeeded his father Ever-



getes on the throne of Egypt, and received the surname of Philopater by Antiphrasis, because, according to some historians, he destroyed his father by poison. He began his reign with acts of the greatest cruelty, and sacrificed to his avarice his own mother, his wife, his sister, and his brother. He received the name of Tiphon, from his extravagance and debauchery, and that of Gallus, because he appeared in the streets of Alexandria like one of the bacchanals, and with all the gestures of the priests of Cybele. He was remarkably hostile to the Jewish nation, whom he attempted to extirpate. At length being weakened and enervated by intemperance and continual debauchery, Philopater died in the 37th year of his age, after a reign of 17 years, 204 years before the Christian era.—The 5th, succeeded his father Philopater as king of Egypt, though only in the fourth year of his age. During the years of his minority he was under the protection of Sosicius and of Aristomenes. When Ptolemy reached his 14th year, according to the laws and customs of Egypt, the years of his minority expired, and he ascended the throne. He received the surname of Epiphanes, or Illustrious, and was crowned at Alexandria with the greatest solemnity. He soon, however, betrayed the same vices which had characterized his father, and his cruelties raised seditions among his subjects. After a reign of 24 years, 180 years before Christ, Ptolemy was poisoned by his ministers, whom he had threatened to rob of their possessions to carry on a war against Seleucus king of Syria.—The 6th, succeeded his father Epiphanes on the Egyptian throne, and received the surname of Philometer by Antiphrasis, on account of his hatred against his mother Cleopatra. He was in the sixth year of his age when he ascended the throne, and during his minority the kingdom was governed by his mother, and at her death by an eunuch, one of his favourites. He made war against Antiochus Epiphanes, and after several successes, he fell into the hands of his enemy. During the captivity of Philometer, the Egyptians raised to the throne his younger brother Ptolemy Physcon, also son of Epiphanes, but Antiochus turned his arms against the usurper, and restored Philometer. This artful behaviour of Antiochus was soon comprehended by Philometer; he recalled his brother Physcon, and made him partner on the throne, and concerted with him how to repel their common enemy. Philometer died 145 years before the Christian era, leaving Physcon master of Egypt, and all the dependent provinces. Philometer has been commended by some historians for his clemency and moderation.—The 7th Ptolemy, surnamed Physcon, on account of the prominence of his belly, ascended the throne of Egypt after the death of his brother Philometer, and as he had reigned for some time conjointly with him (see Ptolemy 6th.) his succession was approved, though the wife and the son of the deceased monarch had laid claims to the crown. However, it was at last agreed, that Physcon should marry the queen, and that her son should succeed on the throne at his

death. The nuptials were accordingly celebrated, but on that very day the tyrant murdered Cleopatra's son in her arms. He ordered himself to be called Evergetes, but the Alexandrians refused to do it, and stigmatized him with the appellation of Kakergetes, or evil-deer. A series of barbarity rendered him odious to his subjects, and having at length become without friends or support in Egypt, he fled to Cyprus, and Cleopatra, his divorced queen, ascended the throne. In his banishment Physcon levied an army, and soon after this he invaded Egypt, and obtained a victory over the forces of Cleopatra. This decisive blow restored Physcon to his throne, where he continued to reign for some time, hated by his subjects and feared by his enemies. He died at Alexandria in the 67th year of his age, after a reign of 29 years, about 116 years before Christ.—The 8th, surnamed Lathyrus, from an excrescence like a pea on the nose, succeeded his father Physcon as king of Egypt. He had no sooner ascended the throne, than his mother Cleopatra, who reigned conjointly with him, expelled him to Cyprus, and placed the crown on the head of his brother Ptolemy Alexander, her favourite son. Lathyrus, banished from Egypt, became king of Cyprus, where he continued to reign till the death of his brother Alexander restored him to his possessions. Lathyrus died 81 years before the Christian era, after a reign of thirty-five years since the death of his father Physcon, eleven of which he had passed with his mother Cleopatra, on the Egyptian throne, eighteen in Cyprus, and seven after his mother's death. He was succeeded by his only daughter Cleopatra, whom Alexander, the son of Ptolemy Alexander, by means of the dictator Sylla, soon after married and murdered.—The 9th, (See Alexander Ptolemy 1st.) For the 10th Ptolemy, (See Alexander Ptolemy 2d.) For the 11th, (See Alexander Ptolemy 3d.)—The 12th, the illegitimate son of Lathyrus, ascended the throne of Egypt at the death of Alexander 3d. He received the surname of Auletes, because he played skillfully on the flute. He was established in the succession by Cæsar the consul, who granted him the alliance of the Romans, after he had received the enormous sum of about 1,162,500l. sterling. Auletes, however, was obliged some time after to fly from his kingdom, and seek protection among the most powerful of his allies, and during his absence from Alexandria, his daughter Berenice made herself absolute, and established herself on the throne, but she was soon driven from Egypt, when Gabinius, at the head of a Roman army, approached to replace Auletes on his throne. He was no sooner restored than he sacrificed to his ambition his daughter Berenice. Auletes died four years after his restoration, about 51 years before the Christian era.—The 13th, surnamed Dionysius or Bacchus, ascended the throne of Egypt conjointly with his sister Cleopatra, whom he had married, according to the directions of his father Auletes. He was under the care and protection of Pompey the Great, but the wickedness and avarice of his ministers

soon obliged him to drive away his sister from the throne, and to reign independent. He was then in the 13th year of his age when his guardian, after the fatal battle of Pharsalia, came to the shores of Egypt, and claimed his protection. He refused to grant the required assistance, and basely murdered Pompey after he had brought him to shore under the mask of friendship. Cæsar, who pursued Pompey to Egypt, became the arbiter on the succession of the throne of that kingdom, and having arrived at Alexandria, he found the king of Egypt as faithless to his cause as to that of his fallen enemy; he ordered the will of Auletes to be read, and he confirmed Ptolemy and Cleopatra in the possession of Egypt. This decision did not please Ptolemy, who thereupon refused to acknowledge Cæsar a mediator. The Roman enforced his authority by arms, and three victories were obtained over the Egyptian forces. Ptolemy, who had been for some time a prisoner in the hands of Cæsar, now headed his armies, but a defeat was fatal, and as he attempted to save his life by flight, he was drowned in the Nile, about 46 years before Christ, and three years and eight months after the death of Auletes. Cleopatra, at the death of her brother, became sole mistress of Egypt, but, as the Egyptians were no friends to female government, Cæsar obliged her to marry her younger brother Ptolemy, who was then in the eleventh year of his age.

PTOLEMY, or PTOLOMY (Claudius), a very celebrated geographer, astronomer, and mathematician, among the ancients, was born at Pelusium in Egypt, about the 70th year of the Christian era; and died, it has been said, in the 78th year of his age, and in the year of Christ 147. He taught astronomy at Alexandria in Egypt, where he made many astronomical observations, and composed his other works. It is certain that he flourished in the reigns of Marcus Antoninus and Adrian: for it is noted in his Canon, that Antoninus Pius reigned 23 years, which shews that he himself survived him; he also tells us in one place, that he made a great many observations upon the fixed stars at Alexandria, in the second year of Antoninus Pius; and in another, that he observed an eclipse of the moon, in the ninth year of Adrian; from which it is reasonable to conclude that this astronomer's observations upon the heavens were many of them made between the year 125 and 140.

Ptolemy has always been reckoned the prince of astronomers among the ancients, and in his works has left an entire body of that science. He has preserved and transmitted to us the observations and principal discoveries of the ancients, and at the same time augmented and enriched them with his own. He corrected Hipparchus's catalogue of the fixed stars; and formed tables, by which the motions of the sun, moon, and planets might be calculated and regulated. He was indeed the first who collected the scattered and detached observations of the ancients, and digested them into a system; which he sets forth in his *Μεγαλή Συναξίς*, sive

Magna Constructio, divided into 13 books. He adopts and exhibits here the ancient system of the world, which placed the earth in the centre of the universe; and this has been called from him the Ptolemaic System, to distinguish it from those of Copernicus and Tycho Brahe.

About the year 827 this work was translated by the Arabians into their language, in which it was called *Almagestum*, by order of one of their kings; and from Arabic into Latin, about 1230, by the encouragement of the emperor Frederic the 2d. There were also other versions from the Arabic into Latin; and a manuscript of one, done by Girardus Cremonensis, who flourished about the middle of the 14th century, Fabricius says, is still extant in the library of All Souls College in Oxford. The Greek text of this work began to be read in Europe in the 15th century; and was first published by Simon Grynæus at Basil, 1538, in folio, with the eleven books of commentaries by Theon, who flourished at Alexandria in the reign of the elder Theodosius. In 1541 it was reprinted at Basil, with a Latin version by George Trapezond; and again at the same place in 1551, with the addition of other works of Ptolemy, and Latin versions by Camerarius. We learn from Kepler, that this last edition was used by Tycho.

Of this principal work of the ancient astronomers it may not be improper to give here a more particular account. In general, it may be observed, that the work is founded upon the hypothesis of the earth's being at rest in the centre of the universe, and that the heavenly bodies, the stars and planets, all move round it in solid orbs, whose motions are all directed by one, which Ptolemy called the *Primum Mobile*, or first mover, of which he discourses at large. But, to be more particular, this great work is divided into 13 books.

In the first book, Ptolemy shews, that the earth is in the centre of those orbs, and of the universe itself, as he understood it: he represents the earth as of a spherical figure, and but as a point in comparison of the rest of the heavenly bodies: he treats concerning the several circles of the earth, and their distances from the equator; as also of the right and oblique ascension of the heavenly bodies in a right sphere.

In the 2d book, he treats of the habitable parts of the earth; of the elevation of the pole in an oblique sphere and the various angles which the several circles make with the horizon, according to the different latitude of places; also of the phenomena of the heavenly bodies depending on the same.

In the 3d book he treats of the quantity of the year, and of the unequal motion of the sun through the zodiac: he here gives the method of computing the mean motion of the sun, with tables of the same; and likewise treats of the inequality of days and nights.

In the 4th book, he treats of the lunar motions, and their various phenomena: he gives tables for finding the moon's mean motions, with her latitude and longitude: he discourses



largely concerning lunar epicycles; and by comparing the times of a great number of eclipses, mentioned by Hipparchus, Calippus, and others, he has computed the place of the sun and moon, according to their mean motions, from the first year of Nabonazar, king of Egypt, to his own time.

In the 5th book, he treats of the instrument called the Astrolabe: he treats also of the eccentricity of the lunar orbit, and the inequality of the moon's motion, according to her distance from the sun: he also gives tables and an universal canon for the inequality of the lunar motions: he then treats of the different aspects or phases of the moon, and gives a computation of the diameter of the sun and moon, with the magnitude of the sun, moon, and earth compared together; he states also the different measures of the distance of the sun and moon, according as they are determined by ancient mathematicians and philosophers.

In the 6th book, he treats of the conjunctions and oppositions of the sun and moon, with tables for computing the mean time when they happen; of the boundaries of solar and lunar eclipses; of the tables and methods of computing the eclipses of the sun and moon, with many other particulars.

In the 7th book, he treats of the fixed stars; and shews the methods of describing them, in their various constellations, on the surface of an artificial sphere or globe: he rectifies the places of the stars to his own time, and shews how different those places were then from what they had been in the times of Timocharis, Hipparchus, Aristillus, Calippus, and others: he then lays down a catalogue of the stars in each of the northern constellations, with their latitude, longitude, and magnitudes.

In the 8th book, he gives a like catalogue of the stars in the constellations of the southern hemisphere, and in the 12 signs or constellations of the zodiac. This is the first catalogue of the stars now extant, and forms the most valuable part of Ptolemy's works. He then treats of the galaxy, or milky-way; also of the planetary aspects, with the rising and setting of the sun, moon, and stars.

In the 9th book, he treats of the order of the sun, moon, and planets, with the periodical revolutions of the five planets; then he gives tables of the mean motions, beginning with the theory of Mercury, and shewing its various phenomena with respect to the earth.

The 10th book begins with the theory of the planet Venus, treating of its greatest distance from the sun; of its epicycle, eccentricity, and periodical motions: it then treats of the same particulars in the planet Mars.

The 11th book treats of the same circumstances in the theory of the planets Jupiter and Saturn. It also corrects all the planetary motions from observations made from the time of Nabonazar to his own.

The 12th book treats of the retrogressive motion of the several planets; giving also tables of their stations, and of the greatest distances of Venus and Mercury from the sun.

The 13th book treats of the several hypotheses of the latitude of the five planets; of the greatest latitude, or inclination of the orbits of the five planets, which are computed and disposed in tables; of the rising and setting of the planets, with tables of them. Then follows a conclusion or winding up of the whole work.

This great work of Ptolemy will always be valuable on account of the observations he gives of the places of the stars and planets in former times, and according to ancient philosophers and astronomers that were then extant; but principally on account of the large and curious catalogue of the stars, which being compared with their places at present, we thence deduce the true quantity of their slow progressive motion according to the order of the signs, or of the precession of the equinoxes.

Another great and important work of Ptolemy was, his Geography, in 7 books; in which, with his usual sagacity, he searches out and marks the situation of places according to their latitudes and longitudes; and he was the first that did so. Though this work must needs fall far short of perfection, through the want of necessary observations, yet it is of considerable merit, and has been very useful to modern geographers. Cellarius indeed suspects, and he was a very competent judge, that Ptolemy did not use all the care and application which the nature of his work required; and his reason is, that the author delivers himself with the same fluency and appearance of certainty, concerning things and places at the remotest distance, which it was impossible he could know any thing of, that he does concerning those which lay the nearest to him, and fall the most under his cognizance. Salmasius had before made some remarks to the same purpose upon this work of Ptolemy. The Greek text of this work was first published by itself at Basil in 1533, in 4to: afterwards with a Latin version and notes by Gerard Mercator, at Amsterdam, 1605; which last edition was reprinted at the same place, 1618, in folio, with neat geographical tables, by Bertius.

Other works of Ptolemy, though less considerable than these two, are still extant. As, *Libri quatuor de Judiciis Astrorum*, upon the first two books of which Cardan wrote a commentary.—*Fructus Librorum suorum*; a kind of supplement to the former work.—*Recensio Chronologica Regum*: this, with another work of Ptolemy, *De Hypothesibus Planetarum*, was published in 1620, 4to, by John Bainbridge, the Savilian professor of astronomy at Oxford: and Scaliger, Petavius, Dodwell, and the other chronological writers, have made great use of it.—*Apparentiæ Stellarum Inerrantium*: this was published at Paris by Petavius, with a Latin version, 1630, in folio; but from a mutilated copy, the defects of which have since been supplied from a perfect one, which sir Henry Saville had communicated to archbishop Usher, by Fabricius, in the 3d volume of his *Bibliotheca Græca*.—*Elementorum Harmonicorum libri tres*; published in Greek and Latin, with

a commentary by Porphyry the philosopher, by Dr. Wallis at Oxford, 1682, in 4to; and afterwards reprinted there, and inserted in the 3d volume of Wallis's works, 1699, in folio. (*Hutton's Dict.*).

**PTOSIS.** (πτωσις, from πτείνω, to fall.) In medicine, a synonym of blepharoptosis. See BLEPHAROPTOSIS.

**PTOSIS IRIDIS.** Prolapsus iridis, is a prolapsus of the iris through a wound of the cornea. It is known by a blackish tubercle, which prominates a little from the cornea in various forms. The species of the ptosis of the iris are, 1. Ptosius recens, or a recent ptosis from a side wound of the cornea, as that which happens, though rarely, in or after the extraction of the cataract. 2. Ptosius inveterata, in which the incarcerated prolapsed iris is grown or attached to the wound or ulcer, and by the air has become callous or indurated.

**PTYALISM.** (πτυαλισμος, from πτυαλιζω, to spit.) A salivation, or increased secretion of saliva from the mouth.

**PTYSMAGOGUE.** s. (πτυσμα and αγω.) A medicine which discharges spittle.

**PUBERTY.** s. (*pulertas*, Latin.) The time of life in which the two sexes begin first to be acquainted (*Bentley*).

**PUBES.** (from βουβων, the groin.) The external part of the organs of generation of both sexes, which is covered with hair.

**PUBES.** In botany. Pubescence. Hirsuties omnis in planta. Delin. Pl.—vestiens villositate. All hairiness, or shagginess in a plant; or whatever clothes it with any hairy or villous substance. Linnéus's original word was pubescentia, and he explained it to mean the armour of a plant, by which it is defended from external injuries: thus comprehending thorns and prickles under the idea of pubescence. These however he afterwards separated, and called them with more propriety arma. The following are the different forms of pubescence:

1. Pili. Hairs. Excretory ducts, in that form.

2. Lana. Wool; or close curled hairs.

3. Barba. Beard; or parallel hairs.

4. Tomentum. Flocks; or interwoven villous hairs scarcely conspicuous.

5. Strigæ. Stiffish flattish hairs.

6. Setæ. Bristles. Stiffish roundish hairs.

7. Hami. Hooks. Sharp crooked points.

8. Glochides. Barbs. Straight toothed points.

9. Glandulæ. Glands. Small papillæ or teats, or excretory ducts in that form.

Yet glands seem to be improperly enumerated as a species of pubescence.

**PUBESCENCE.** s. (from *pubesco*, Latin.) The state of arriving at puberty (*Brown*).

**PUBESCENT.** a. (*pubescens*, Lat.) Arriving at puberty (*Brown*).

**PUBIS** (Os). A bone of the fetal pelvis. See INNOMINATUM OS.

**PUBLIC.** a. (*publique*, Fr. *publicus*, Lat.)

1. Belonging to a state or nation; not private (*Hooker*). 2. Open; notorious; generally known (*Mat.*). 3. General; done by many

(*Milton*). 4. Regarding not private interest, but the good of the community (*Clarendon*).

5. Open for general entertainment (*Addison*).

**PUBLIC.** s. (from *publicus*, Latin.) 1. The general body of mankind, or of a state or nation; the people (*Addison*). 2. Open view; general notice (*Locke*).

**PUBLICAN.** s. (from *publicus*, Latin.) 1. A toll-gatherer (*Matthew*). 2. A man that keeps a house of general entertainment.

**PUBLICATION.** s. (from *publico*, Lat.) 1. The act of publishing; the act of notifying to the world; divulgation (*Hooker*). 2. Edition; the act of giving a book to the public (*Pope*).

**PUBLICLY.** ad. (from *public*.) 1. In the name of the community (*Addison*). 2. Openly; without concealment (*Bacon*).

**PUBLICNESS.** s. (from *public*.) 1. State of belonging to the community (*Boyle*). 2. Openness; state of being generally known or public.

**PUBLICSPIRITED.** a. (*public* and *spirit*.) Having regard to the general advantage above private good (*Dryden*).

**To PUBLISH.** v. a. (*publier*, French.) 1. To discover to mankind; to make generally and openly known (*Milton*). 2. To put forth a book into the world (*Digby*).

**PUBLISHER.** s. (from *publish*.) 1. One who makes public or generally known (*Atterbury*). 2. One who puts out a book into the world (*Prior*).

**PUBLIUS SYRUS**, a Syrian mimic poet, who flourished about 44 years B.C. He was originally a slave sold to Domitius, who brought him up with great attention, and gave him his freedom. He gained the esteem of the most powerful at Rome, and reckoned J. Cæsar among his patrons. There remains of Publius a collection of moral sentences, written in iambics.—2. Publius, was a prænomen, very common among the Romans.—3. A prætor who conquered Palæopolis. He was only a plebeian, and though neither consul nor dictator, he obtained a triumph in spite of the opposition of the senators. He was the first who was honoured with a triumph during a prætorship.

**PUCCINIA**, in botany, a genus of the class cryptogamia, order fungi. Fungus cylindrical, filled with tailed seeds, radiately disposed, and escaping elastically. Two species; exotics.

**PUCELAGE.** s. (French.) A state of virginity.

**PUCCOON**, in botany. See SANGUINARIA.

**PUCERON**, in entomology. See APHIS.

**PUCK.** s. (perhaps the same with *pug*.) Some sprite among the fairies, common in romances (*Corbet*).

**PUCKBALL**, or **PUCKFIET.** s. (from *puck*, a fairy's ball.) A kind of mushroom full of dust.

**To PUCKER.** v. a. (from *puck* the fairy.) To gather into corrugations; to contract into folds or plications (*Spectator*).

**PUCKHOLI**, a town of Hindustan Pro-



per in the province of Lahore, 86 miles S.W. of Cashmere, and 145 N.W. of Lahore. Lon. 72. 5 E. Lat. 33. 45 N.

**PUDDAR**, a river of Hindustan Proper, which rises in the S.W. part of Agimere, divides the provinces of Cutch and Guzerat, and falls into the gulph of Cutch.

**PUDDER**. *s.* (*fudur*, Islandic, a rapid motion.) A tumult; a turbulent and irregular bustle. Commonly written *potter* (*Locke*).

To **PU'DDER**. *v. n.* (from the noun.) To make a tumult; to make a bustle (*Locke*).

To **PU'DDER**. *v. a.* To perplex; to disturb; to confound (*Locke*).

**PUDDING**. *s.* (*puding*, Swedish.) 1. A kind of food very variously compounded, but generally made of meal, milk, and eggs. 2. The gut of an animal (*Shakspeare*). 3. A bowel stuffed with certain mixtures of meal and other ingredients. 4. A proverbial name for victuals (*Prior*).

**PUDDING GRASS**. See **MENTHA PULEGIUM**.

**PUDDING-PIPE GRASS**. See **CASSIA**.

**PUDDING-FISH**, in ichthyology. See **SPARUS**.

**PUDDING-WEED**. See **ALCYONIUM**.

**PUDDING-STONE**. See **BRECCIA**.

**PU'DDINGPIE**. *s.* (*pudding and pie*.) A pudding with meat baked in it (*Hudibras*).

**PU'DDINGTIME**. *s.* (*pudding and time*.) 1. The time of dinner; the time at which pudding, anciently the first dish, is set upon the table. 2. Nick of time; critical minute (*Hudibras*).

**PU'DDLE**. *s.* (from *puteolus*, Lat. *Skinner*.)

A small muddy lake; a dirty plash (*Hall*).

To **PU'DDLE**. *v. a.* (from the noun.) To muddy; to foul or pollute with dirt; to mix dirt and water (*Sidney*).

**PU'DDLY**. *a.* (from *puddle*.) Muddy; dirty; miry (*Carew*).

**PU'DDOCK**, or **PURROCK**. *s.* (for *paddock* or *parrock*.) A provincial word for a small enclosure.

**PU'DENCY**. *s.* (*pudens*, Latin.) Modesty; shamefacedness (*Shakspeare*).

**PUDENDA**. (from *pudor*, shame.) The parts of generation.

**PUDICAL ARTERY**. *Arteria pudica*. Pudendal artery. A branch of the internal iliac distributed on the organs of generation.

**PUDICITY**. *s.* (*pudicité*, French; from *pudicitia*, Latin.) Modesty; chastity.

**PUDOGA**, a town of Russia, in the government of Olonetz; situate on the E. coast of the lake Onezkoë, 108 miles E. of Olonetz. Lon. 36. 30 E. Lat. 61. 36 N.

**PUEBLA**, a town of Spain, in Galicia, near the Atlantic, 25 miles S.S.W. of Compostella. Lon. 8. 7 W. Lat. 42. 34 N.

**PUEBLA**, a town of Spain, in Estremadura, seated near the Guadiana, 15 miles W. of Merida. Lon. 6. 23 W. Lat. 38. 42 N.

**PUEBLA-DE-LOS-ANGELOS**, a town of New Spain, in the audience of Mexico, and province of Tlascala, of which it is the capital,

with a bishop's see. It is 62 miles S.E. of Mexico.

**PUEBLA-NUOVA**, a seaport of New Spain, in the audience of Guatemala, and province of Veragua. It is seated on a bay of the Pacific Ocean, 200 miles W. of Panama. Lon. 83. 28 W. Lat. 8. 48 N.

**PUNTE-DEL-ARCOBISPO**, a town of Spain, in Estremadura, which belongs to the archbishop of Toledo, and is seated on the river Tajo, over which is a handsome bridge, 40 miles S.W. of Toledo. Lon. 4. 15 W. Lat. 39. 38 N.

**PUNTE-DE-LA-REYNE**, a town of Spain, in Navarre, seated on the river Agra, 10 miles S.W. of Pampeluna. Lon. 1. 39 W. Lat. 42. 41 N.

**PU'ERILE**. *a.* (*puerile*, Fr. *puerilis*, Lat.) Childish; boyish (*Pope*).

**PUERI'LITY**. *s.* (*puerilitas*, Lat.) Childishness; boyishness (*Dryden*).

**PUERPERAL FEVER**. Childbed fever. Cullen considers this disease as a species of continued fever.

**PUERTO BELLO**, **PUERTO RICO**, &c. For all names, which, in the Spanish language, signify a port, see **PORTO**; for, although that word is not Spanish, but Italian, it is better to adhere to it in this work, in conformity to the English pronunciation.

**PUFF**. *s.* (*pos*, Dutch.) 1. A quick blast with the mouth (*Philips*). 2. A small blast of wind (*Raleigh*). 3. A fungous ball filled with dust. 4. Any thing light and porous; as, *puff* paste. 5. Something to sprinkle powder on the hair.

To **PUFF**. *v. n.* (*boffen*, Dutch.) 1. To swell the cheeks with wind. 2. To blow with a quick blast (*Shaks.*). 3. To blow with scornfulness (*South*). 4. To breathe thick and hard (*L'Estrange*). 5. To do or move with hurry, tumour, or tumultuous agitation (*Herbert*). 6. To swell with the wind or air (*Boyle*).

To **PUFF**. *v. a.* 1. To swell as with wind (*Ray*). 2. To drive or agitate with blasts of wind (*Shaks.*). 3. To drive with a blast of breath scornfully (*Dryden*). 4. To swell or blow up with praise (*Bacon*). 5. To swell or elate with pride (*Shakspeare*).

**PUFFBALL**. See **LYCOPERDON**.

**PUFFENDORF** (Samuel de), was born in 1631, at Fleh, a little village in Misnia, a province in Upper Saxony; and was son of Elias Puffendorf, minister of that place. After having made great progress in the sciences at Leipzig, he turned his thoughts to the study of the public law, which in Germany consists of the knowledge of the rights of the empire over the princes and states of which it is composed, and those of the princes and states with respect to each other. But though he used his utmost efforts to distinguish himself, he despised the various titles which are so much sought for at universities, and never would take the degree of doctor. He accepted the place of governor to the son of Mr. Coyet, a Swedish nobleman who was then ambassador from Sweden to the

court of Denmark. For this purpose he went to Copenhagen, but continued not long at ease there; for the war being renewed some time after between Denmark and Sweden, he was seized with the whole family of the ambassador. During his confinement, which lasted eight months, as he had no books, and was allowed to see no person, he amused himself by meditating on what he read in Grotius's treatise *De Jure Belli et Pacis*, and the political writings of Mr. Hobbes. Out of these he drew up a short system, to which he added some thoughts of his own, and published it at the Hague in 1660, under the title of *Elementa Jurisprudentiæ Universalis*. This recommended him to the elector Palatine, who invited him to the university of Heidelberg, where he founded in his favour a professorship of the law of nature and nations, which was the first of that kind established in Germany. Puffendorf remained at Heidelberg till 1673, when Charles XI. of Sweden gave him an invitation to be professor of the law of nature and nations at Lund; which place the elector Palatine reluctantly allowed him to accept. He went thither the same year; and after that time his reputation greatly increased. Some years after the king of Sweden sent for him to Stockholm, and made him his historiographer, and one of his counsellors. In 1688, the elector of Brandenburg obtained the consent of his Swedish majesty, that he should come to Berlin, in order to write the history of the elector William the Great; and in 1694 made him a baron. But he died that same year of an inflammation in his feet, occasioned by cutting his nails; having attained his grand climacteric. Of his works, which are numerous, the following are the principal: 1. A Treatise on the Law of Nature and Nations, written in German; of which there is an English translation with Barbeyrac's notes. 2. An Introduction to the History of the Principal States which at present subsist in Europe; written in German; which has been also translated into English. 3. The History of Sweden from Gustavus Adolphus's Expedition into Germany to the Abdication of Queen Christina. 4. The History of Charles Gustavus, two volumes folio, &c.

**PUFFER.** *s.* (from *puff*.) One that puffs.

**PUFFIN.** *s.* (*puffino*, Italian.) In ornithology. See **ALCA**.

**PUFFINGLY.** *ad.* (from *puffing*.) 1. Tumidly; with swell. 2. With shortness of breath.

**PUFFY.** *a.* (from *puff*.) 1. Windy; flatulent (*Wiseman*). 2. Tumid; turgid (*Dryden*).

**PUG.** *s.* (*piza*, Saxon.) A kind name of a monkey or any thing tenderly loved (*Adison*).

**PUGET** (Peter Paul), one of the greatest painters and sculptors France ever produced, though but little noticed by their own writers, was born at Marseilles in 1623. In his youth he was the disciple of Roman, an able sculptor; and then went to Italy, where he studied

painting and architecture. In painting he so well imitated the manner of Peter de Cortona, that this painter desired to see him, and entered into a friendship with him. In 1657, a dangerous disorder obliged him to renounce the pencil, and devote himself to sculpture; and his reputation causing him to be invited to Paris, he enjoyed a pension of 1200 crowns as sculptor and director of the works relating to vessels and galleys. He died at Marseilles in 1695, and has left a number of admirable statues behind him both in France and Italy.

**PUGGERED.** *a.* (perhaps for *puckered*.) Crowded; complicated (*More*).

**PUGH.** *interj.* A word of contempt.

**PUGIL.** *s.* (*pugille*, French.) What is taken up between the thumb and first two fingers (*Bacon*).

**PUGIONUM**, in botany, a genus of the class tetradynamia, order siliculosæ. Silicle transversely oval, terminated on each side by a horn, without valves, two-seeded; seed coated. One species; a native of Siberia.

**PUGLIA**, the modern name of the ancient Apulia, containing the three provinces of Capitanata, Bari, and Otranto, on the E. side of the kingdom of Naples.

**PUGNACIOUS.** *a.* (*pugnax*, Latin.) Inclined to fight; quarrelsome; fighting.

**PUGNACITY.** *s.* (from *pugnax*, Latin.) Quarrelsome; inclination to fight.

**PUISNE.** *a.* (*puis nê*, French.) 1. Young; younger; later in time (*Hale*). 2. Inferiour; lower in rank (*Bacon*). 3. Petty; inconsiderable; small (*Shakspeare*).

**PUISSANCE.** *s.* (*puissance*, Fr.) Power; strength; force (*Milton*).

**PUISSANT.** *a.* (*puissant*, French.) Powerful; strong; forcible (*Raleigh*).

**PUISSANTLY.** *ad.* Powerfully; forcibly.

**PUKE.** *s.* (of uncertain derivation.) 1. Vomit. 2. Medicine causing vomit.

**To PUKE.** *v. n.* To spew; to vomit (*Shakspeare*).

**PUKER.** *s.* (from *puke*.) A medicine causing vomit (*Garth*).

**PULAON**, an island in the Indian Ocean, lying on the W. of the Philippines. It is very fertile, and subject to its own king, who is tributary to that of Borneo. Lon. 129. 12 E. Lat. 9. 30 N.

**PULCHERIA.** The most remarkable of this name is—A daughter of Arcadius, who held the government of the Roman empire for many years. She was mother of Valentinian. Her piety, and her private as well as public virtues, have been universally admired. She died A. D. 452, and was interred at Ravenna, where her tomb is still to be seen.

**PULCHRITUDE.** *s.* (*pulchritudo*, Latin.) Beauty; grace; handsomeness (*More*).

**To PULE.** *v. n.* (*piauler*, French.) 1. To cry like a chicken (*Bacon*). 2. To whine; to cry; to whimper (*Locke*).

**PULEGIUM.** (from *pulex*, a flea; because the smell of its leaves burnt destroys fleas.) Pennyroyal. *Mentha pulegium* of Linnæus.



*Mentha floribus verticillatis, foliis ovatis obtusis suberenatis, caulibus subteretibus repentibus.* C. O. Didynamia, Gymnospermia. This plant is considered as a carminative, stomachic, and emmenagogue; and is in very common use in hysterical disorders. The official preparations of pennyroyal are, a simple water, a spirit, and an essential oil.

**PULEGIUM CERVINUM.** Hart's pennyroyal. *Mentha cervina* of Linnéus. This plant possesses the virtues of pennyroyal in a very great degree; but is remarkably unpleasant. It is seldom employed but by the country people, who substitute it for pennyroyal.

**PULEX.** Flea. In zoology, a genus of the class insecta, order aptera. Mouth without jaws or feelers, with a long inflected proboscis, covered at the base with two ovate laminæ, the sheath two-valved, five-jointed, and concealing a single bristle; lip rounded and fringed with reflected prickles; antennæ projecting, moniliform; eyes two; abdomen compressed; legs six, formed for leaping. Two species. 1. *P. irritans.* Bed-flea. Proboscis shorter than the body. This insect is said to prefer the more delicate skin of women; and to feed neither upon epileptic persons, upon the dead, nor the dying. Other animals, as well as man, suffer by its intrusions. It nestles in the fur of dogs, cats, and rats; and the nests of the river swallow swarm with them. The antennæ are longer than the thorax; body of a dark brown colour, and of an oval form; walks but little; but by the elasticity of its legs, can spring above two hundred times the length of its own body. From microscopic observations which have been made upon this animal, it has been found to be oviparous. The eggs are deposited on blankets, or among the down of animals; they are round and smooth; and in four or five days give birth to a very minute larvæ, which feeds upon greasy fur. After having crept about for a few days, the larvæ spins a silken cod, in which it lies dormant for about a fortnight in its pupæ state; after which it bursts from its confinement, endowed with powers to disturb the peace of quadrupeds and of man.

Preparations of mercury are effectual in destroying the flea, and most other noxious vermin. In some places bugs, fleas, and other abominable insects, are held in superstitious veneration. At Surat, there is an hospital endowed for their preservation; where every night some poor wretch suffers himself to be preyed upon for their sustenance. They fasten him naked upon a bed, where he is deprived of the means of self-defence; and the famished pensioners riot in his blood during the whole night. Another foundation of a similar nature, but less ludicrous, is erected in Turkey, for decayed or infirm dogs.

2. *P. penetrans.* Chigoe, or chigger. Proboscis as long as the body; body reddish-brown; abdomen of the female when gravid, orbicular and swollen to nearly a hundred times its usual size. Inhabits South America, and is very troublesome in the sugar-colonies, penetrating the skin of the inhabitants, where it lodges its

eggs, and causes malignant and often fatal ulcers.

In proof of the great strength and agility of the common flea (*P. irritans*), we quote the following account from Martin's *Miscellaneous Correspondence*, vol. iii. p. 75. "Mr. Boverick, a watch-maker in the Strand, lately made and shewed to vast numbers of people, not only a chaise having four wheels and all its proper apparatus, together with a man sitting thereon; the whole formed with ivory, and drawn along by a flea;—but likewise a landau, which opens and shuts by springs, with six horses harnessed thereto, a coachman sitting on the box, and a dog between his legs; four people in the landau, two footmen behind it, and a postilion riding one of the fore-horses. This equipage a flea is fastened to, and draws very easily along.

Mr. B. has also made a chain of brass, about two inches long, containing 200 links, with a hook at one end, and a padlock and key at the other; all which together weigh less than a third part of the whole machine. Here too a flea is made use of to draw the chain, which it does very nimbly, and with as little trouble as can be imagined. "Of this curious spectacle we ourselves," says Martin, "made a part of the admiring multitude, who had the satisfaction to behold it."

**PULHELY**, a town of Wales, in Carnarvonshire, with a market on Wednesday, seated on an inlet of Cardigan bay, between two rivers, 16 miles S. of Carnarvon, and 243 N.W. of London.

**PULICARIA.** (from *pulex*, a flea; so named because it was thought to destroy fleas if hung in a chamber.) See **PSYLLIUM**.

**PULICASE.** *a. (pulicosus, Lat.)* Abounding with fleas.

**To PULL.** *v. a. (pullian, Saxon.)* 1. To draw violently toward one; opposed to *push*, which is to drive from one (*Ben Jonson*). 2. To draw forcibly (*Hayward*). 3. To pluck; to gather (*Mortimer*). 4. To tear; to rend (*Lamentations*). 5. **To PULL down.** To subvert; to demolish (*Howel*). 6. **To PULL down.** To degrade (*Roscom.*). 7. **To PULL up.** To extirpate; to eradicate (*Locke*).

**PULL. s. (from the verb.)** 1. The act of pulling (*Swift*). 2. Contest; struggle (*Carew*). 3. Pluck; violence suffered (*Shakspeare*).

**PULLER. s. (from pull.)** One that pulls (*Shakspeare*).

**PULLEN. s.** Poultry (*Bailey*).

**PULLET. s. (poulet, Fr.)** A young hen (*Brown*).

**PULLEY**, in mechanics, one of the mechanical powers; consisting of a little wheel, or rundle having a channel around it, and turning on an axis; serving, by means of a rope which slides in its channel, for the raising of weights.

The Latins call it *trochlea*; and the seamen, when fitted with a rope, a tackle. An assemblage of several pulleys is called a system of pulleys, or polyspaston: some of which are in a block or case, which is fixed; and others in a block which is moveable, and rises with the

## P U L L E Y.

weight. The moveable wheel or rundle, is called the sheave or shiver; the axis on which it turns, the gudgeon; and the fixed piece of wood or iron, into which it is put, the block.

*Doctrine of the Pulley.*—If the equal weights *W* and *P* (Pl. 145, fig. 2.) hang by the cord *BB* upon the pulley *A*, whose block *b* is fixed to the beam *HI*, they will counterpoise each other, just in the same manner as if the cord was cut in the middle, and its two ends hung upon the hooks fixed in the pulley at *A* and *A*, equally distant from its centre. Hence, a single pulley, if the lines of direction of the power and the weight be tangents to the periphery, neither assists nor impedes the power, but only changes its direction.

The use of the pulley, therefore, is when the vertical direction of a power is to be changed into an horizontal one; or an ascending direction into a descending one; and on the contrary.

This is found a good provision for the safety of the workmen employed in drawing with the pulley.

This change of direction by means of a pulley has this farther advantage; that if any power can exert more force in one direction than another, we are here able to employ it in its greatest force.

Thus, e. gr. a horse cannot draw in a vertical direction, but draws with all its advantage in a horizontal one. By changing the vertical draught, therefore, into a horizontal one, a horse becomes qualified to raise a weight.

But the grand use of the pulley is, where several of them are combined; thus forming what Vitruvius, and others after him, call polyspasta; the advantages whereof are, that the machine takes up but little room, is easily removed, and raises a very great weight with a moderate force.

If a weight *W* hangs at the lower end of the moveable block *p* of the pulley *D*, and the cord *GF* goes under the pulley, it is plain that the half *G* of the cord bears one half of the weight *W*, and the half *F* the other; for they bear the whole between them. Therefore, whatever holds the upper end of either rope, sustains one half of the weight; and if the cord at *F* be drawn up so as to raise the pulley *D* to *C*, the cord will then be extended to its whole length, except that part which goes under the pulley; and consequently the power that draws the cord will have moved twice as far as the pulley *D* with its weight *W* rises; on which account, a power whose intensity is equal to one half of the weight, will be able to support it, because if the power moves (by means of a small addition) its velocity will be double the velocity of the weight; as may be seen by putting the cord over the fixed pulley *C* (which only changes the direction of the power, without giving any advantage to it) and hanging on the weight *P*, which is equal only to one half of the weight *W*; in which case there will be an equilibrium, and a little addition to *P* will cause it to descend, and raise *W* through a space equal to one half of that through which *P* descends. Hence, the advantage gained will be always equal to twice the number of pulleys in

the moveable or undermost block. So that, when the upper or fixed block *u* contains two pulleys, which only turn on their axes, and the lower or moveable block *U* contains two pulleys, which not only turn upon their axes, but also rise with the block and weight, the advantage gained by this is as four to the working power. Thus, if one end of the rope *KMOQ* be fixed to a hook at *L*, and the rope passes over the pulleys *N* and *R*, and under the pulleys *L* and *P*, and has a weight *T* of one pound hung to its other end at *T*, this weight will balance and support a weight *W* of four pounds, hanging by a hook at the moveable block *U*, allowing the said block as a part of the weight. And if as much more power be added, as is sufficient to overcome the friction of the pulleys, the power will descend with four times as much velocity as the weight rises, and consequently through four times as much space. The two pulleys in the fixed block *X*, and the two in the moveable block *Y*, are in the same case with those last mentioned; and those in the lower block give the same advantage to the power.

Another very useful combination of pulleys is that in fig. 3, pl. 145, where a weight or force at *P* will balance another at *W* of sixteen times its magnitude. If a power move a weight by means of several pulleys, the space passed over by the power will be to the space passed over by the weight, as the weight to the power.

Hence, the smaller the force that sustains a weight by means of pulleys is, the slower is the weight raised: so that what is saved in force, is spent in time.

The common methods of arranging pulleys in their blocks may be reduced to two. The first consists in placing them one by the side of another, upon the same pin; the other, in placing them directly under one another, upon separate pins. Each of these methods is liable to inconvenience. Mr. Smeaton, in order to avoid the impediments to which these combinations are subject, proposes to combine these two methods in one. Accordingly, the pulleys are placed in each block in two tiers; several being upon the same pin, as in the first method, and every one having another under it, as in the second; and so that, when the tackle is in use, the two tiers that are the remotest from one another, are so much larger in diameter than those that are nearest, as to allow the lines of the former to go over the lines of the latter without rubbing. From this construction arises a new method of reeving the line upon the shieves; for here, whatever be the number of shieves, the fall of the tackle will be always upon the middle shieve, or on that next to the middle, according as the number of pulleys in each pin is odd or even. To do this, the line is fixed to some convenient part of the upper block, and brought round the middle shieve of the larger tier of the under block, from thence round one of the same sort next to the centre one of the upper block, and so on, till the line comes to the outside shieve, where the last line of the larger tier falls upon the first shieve of the smaller, and being reeved round



those, till it comes at the opposite side, the line from the last shieve of the smaller tier again rises to the first of the larger, whence it is conducted round, till it ends on the middle shieve of the upper block on the larger tier.

As a system of pulleys has no great weight, and lies in a small compass, it is easily carried about, and can be applied for raising weights in a great many cases, where other engines cannot be used. But they are subject to a great deal of friction, on the following accounts, viz. 1st, because the diameters of their axes bear a very considerable proportion to their own diameters; 2d, because in working they are apt to rub against one another, or against the sides of the block; 3dly, because of the stiffness of the rope that goes over and under them.

To PULLULATE. *v. n.* (*pullulo*, Latin; *pulluler*, French.) To germinate; to bud.

PULMONARIA. Lungwort. In botany, a genus of the class pentandria, order monogynia. Corol funnel-form with the throat pervious; calyx prismatic, five-sided. Seven species: natives of Europe and America; two of our own country. The three following are cultivated.

1. *P. officinalis*. Common or spotted lungwort. Jerusalem cowslips. Perennial, fibrous root; leaves rough-haired; those of the stem ovate oblong, radical ones a little heart-shaped. This plant is rarely found to grow wild in England; but is very commonly cultivated in gardens, where its leaves become broader, and approach more to a cordate shape. The leaves, which are the part medicinally used, have no peculiar smell; but, in their recent state, manifest a slightly astringent and mucilaginous taste; hence it seems not wholly without foundation that they have been supposed to be demulcent and pectoral. They have been recommended in hemoptoës, tickling coughs, and catarrhal defluents upon the lungs. The name *pulmonaria*, however, seems to have arisen rather from the speckled appearance of these leaves, resembling that of the lungs, than from any intrinsic quality which experience discovered to be useful in pulmonary complaints.

2. *P. angustifolia*. Narrow-leaved lungwort. Leaves much narrower than those of the first sort, covered with soft hair; flowers produced in small bunches at the top of the stalks. A native of Europe; flowers from March to May.

3. *P. Virginiana*. Virginian lungwort. Perennial, thick, fleshy root; sending out many small fibres; stalks a foot and half high, dividing at the top into several short branches; flowers blue, red and white, appearing in April. A native of North America.

These plants are propagated by seeds and parting the roots.

PULMONARY. PULMO'NIC. *a.* (from *pulmo*, Latin.) Belonging to the lungs (*Arbuthnot*).

PULMONARY VESSELS. The pulmonary artery, *arteria pulmonalis*, arises from the right ventricle of the heart, and soon divides into the right and left, which ramify throughout the lungs, and form a beautiful net-work on the

air vesicles, where they terminate in the veins, *venæ pulmonales*, whose branches at length form four trunks, which empty themselves into the left auricle of the heart.

PULP. *s.* (*pulpa*, Latin; *pulpe*, French.) 1. Any soft mass (*Bacon*). 2. The soft part of fruit (*Ray*).

PULPIT, an elevated place in a church, whence sermons are delivered. The French give the same name to a reading-desk.

PULPITUM, in the Grecian and Roman theatres, was a place where the players performed their parts. It was lower than the scena, and higher than the orchestra. It nearly answered to what we call the stage, as distinguished from the pit and galleries.—Pulpitum was also a moveable desk or pulpit, from which disputants pronounced their dissertations, and authors recited their works.

PULPOUS. *a.* (from *pulp.*) Soft (*Philips*).

PULPOUS LEAF. A pulpy leaf filled with a tenacious substance between the two surfaces.—Linnæus did not originally distinguish this from carnosous, which has a firmer pulp.

PULPOUSNESS. *s.* (from *pulpous*.) The quality of being pulposous.

PULPY. *a.* (from *pulp.*) Soft; pappy (*Arbuthnot*).

PULSATILLA NIGRICANS. (from *pulso*, to beat about; so called from its being perpetually agitated by the air.) This plant, *Anemone pratensis* of Linnæus, (*Anemone pedunculo involucreto*, petals apice reflexis, foliis bipinnatis; C. O. polyandria, polygynia,) has been received into the Edinburgh pharmacopœia upon the authority of baron Stœrck, who recommended it as an effectual remedy for most of the chronic diseases affecting the eye, particularly amaurosis, cataract, and opacity of the cornea, proceeding from various causes. He likewise found it of great service in venereal nodes, nocturnal pains, ulcers, caries, indurated glands, suppressed menses, serpiginous eruptions, melancholy, and palsy. The plant, in its recent state, has scarcely any smell; but its taste is extremely acid, and, when chewed, it corrodes the tongue and fauces.

PULSATION, the beating or motion of the pulse. See PULSE.

PULSE. PULSUS. (from *pulso*, to beat.) That stroke which is felt on applying the finger to an artery in a living animal. This is occasioned by the reciprocal action of the heart and arteries, the blood being propelled from the left ventricle of the heart into the arteries, so as to be distributed through the whole machine, and in so perceptible a manner, that the distension of the arterial tube can be felt by the finger. But before the time of Hippocrates, the pulses were not attended to, and indeed very slightly by him, as there are only one or two places in which he makes mention of them, throughout the whole of his works. Herophilus was the first who considered the pulse with accuracy, and wrote elaborate treatises on it. In Celsus's time the pulse was very much attended to, and consulted, though he calls it res

fallacissima. Galen, however, wrote most voluminously and laboriously upon this subject, a very good epitome of which may be seen in Prosper Alpinus de Præsignenda Vita & Morte. Boerhaave, in his Institutes, gives an account of all the ancients knew concerning the pulse in a short compass, which is well explained by his commentator, Haller. Long experience, however, has rather confirmed than contradicted the opinion of Celsus, as most publications on this subject will sufficiently prove to an accurate observer. For, notwithstanding the multiplicity of pulses which have been enumerated, it is to the different degrees of irritability in constitutions that the variety of pulses is owing, with respect to their being quick or slow; every accident that happens to the body, and every affection in the mind, having an influence on them; so that very little can be determined from them in practice. The hard and the soft pulse are very often owing to a quantity of fat, or of a cellular membrane being situated betwixt the artery and the finger, or from the almost total absence of these in this situation.—The full and the small pulses are owing chiefly

to the different diameters of the arteries; and except the quick, the slow, and irregular pulses, there are none of the kinds which are so ingeniously distinguished by authors, but that will, on proper enquiry, be found fallacious.

There are adults, in health, whose pulse exceed not forty strokes in a minute; others, whilst they are at rest, have a pulse so quick that it may be counted to 120; and during the presence of a fever, the pulse has been observed in some instances to beat 220 times in the same period. We speak here of the human subject, the pulse in brute animals varying considerably in different species.

The indications of the pulse are generally of importance in veterinary as in human medicine; for by that we can judge of the state of the circulating system, the phenomena of diseases, the patient's strength or weakness, &c.

The following table is given by the late Dr. George Fordyce; and we apprehend it will answer a very useful purpose in affording a precise meaning to the various epithets applied to the pulsations of the arteries in diseases.

| <i>It indicates,</i>                                                              | <i>by</i>     | <i>It is called</i> |
|-----------------------------------------------------------------------------------|---------------|---------------------|
| 1. The strength of the heart's contraction -                                      | Strength.     | Strong.             |
| 2. The quantity of blood thrown out at each contraction - - - - -                 | Weakness.     | Weak.               |
| 3. The number of contractions - - - - -                                           | Fulness.      | Full.               |
| 4. The regularity of its action as to strength, quantity, or frequency. - - - - - | Smallness.    | Small.              |
|                                                                                   | Frequency.    | Frequent.           |
|                                                                                   | Slowness.     | Slow.               |
|                                                                                   | Regularity.   | Regular.            |
|                                                                                   | Irregularity. | Irregular.          |
|                                                                                   | Intermission. | Intermittent.       |
| 5. The strength of the action of the arteries -                                   | Hardness.     | Hard.               |
|                                                                                   | Softness.     | Soft.               |
|                                                                                   | Redoubling.   | Redoubling.         |
|                                                                                   | Trembling.    | Tremulous.          |
| 6. The irritability of the vessels - - - - -                                      | Quickness.    | Quick.              |
|                                                                                   | Regularity.   | Regular.            |
|                                                                                   | Slowness.     | Slow.               |
| 7. The medium diameter of the arteries -                                          | Dilatation.   | Great.              |
|                                                                                   | Contraction.  | Small.              |
| 8. The quantity of blood in the vessels -                                         | Oppression.   | Oppressed.          |
|                                                                                   | Smallness.    | Empty.              |
| 9. The contraction of the capillaries - - - - -                                   | Obstruction.  | Obstructed.         |
|                                                                                   | Freedom.      | Free.               |

This table needs no explanation; though it is in fact no easy matter, in many cases, to make the proper distinctions. In attempting to decide on the state of the pulse, it is of importance too, to know the usual pulsations of the patient when in health; as these differ materially in different subjects. The usual healthy pulse of the horse is about forty strokes in a minute.

PULSE signifies, 1. Oscillation; vibration; alternate expansion and contraction (*Newton*). 2. To feel one's PULSE. To try or know one's mind artfully. 3. (from *pull*.) Leguminous

plants. Plants not reaped but *pulled* or *plucked* (*Milton*).

To PULSE. *v. n.* (from the noun.) To beat as the pulse (*Ray*).

PULSION. *s.* (from *pulsus*, Latin.) The act of driving or forcing forward: in opposition to suction or traction (*More*).

PULTENEY (William), earl of Bath, was born in 1682. He was an eloquent opposer of the ministry in Anne's reign, and at the accession of George I. he was made secretary at war; but after some years of co-operation with Walpole, he disagreed with him in his measures for ad-



vancing the interests of Hanover at the expence of England. Difference of opinion produced hatred, so that Walpole's measures were opposed with personal virulence, and the king at last struck off Pulteney from the list of privy counsellors. This increased the popularity of Pulteney, and his sarcasms were pointed with the most powerful effect against the minister, who often declared that he dreaded his tongue more than another man's sword. Walpole was disgraced in 1741, and Pulteney rose in his seat, and was made earl of Bath; but when he got into place, he lost his popularity. He died 1764. He was concerned in the Craftsman, and wrote some political pamphlets.

**PULTENEY** (Richard), of Loughborough, Leicestershire, after practising as an apothecary at Leicester, took his medical degrees at Edinburgh, 1764. He settled at Blandford, where he acquired reputation. He was fellow of the Royal Society, and died 1801, aged 71. He is author of a general view of the life and writings of Linnæus, 1781—historical and biographical sketches of the progress of botany in England, 2 vols. 8vo. and he made valuable communications to the history of Leicestershire by Mr. Nichols, and to that of Dorsetshire by Hutchins. He also contributed to the Gentleman's Magazine by various dissertations on antiquities, and especially on history.

**PULTENÆA**, in botany, a genus of the class decandria, order monogynia. Calyx five-toothed, with an appendix on each side; corol papilionaceous, with the wings shorter than the standard; legume one-celled, two-seeded. Six species, shrubs of New Holland. See Nat. Hist. Pl. CXXXIV.

**PULTOUSK**, a town of Poland, in the palatinate of Masovia. In 1807, a battle was fought here between the French and Russians, in which both sides claimed the victory. It is seated on the Narew, 30 miles N. of Warsaw.

**PULTOWA**, a fortified town of the Ukraine, famous for a battle in 1709, between Peter the great and Charles XII. of Sweden, wherein the latter was totally defeated. It is 100 miles S.W. of Belgorod. Lon. 34. 25 E. Lat. 49. 26 N.

**PULVERARIA**, in botany, a tribe of algæ, belonging to the genus *LEPRARIA*, which see.

**PULVERABLE**. *a.* (from *pulveris*, Lat.) Possible to be reduced to dust (*Boyle*).

**PULVERIZATION**. *s.* (from *pulverize*.) The act of powdering; reduction to dust or powder.

To **PULVERIZE**. *v. n.* (from *pulveris*, Lat.) To reduce to powder; to reduce to dust (*Boyle*).

**PULVERULENCE**. *s.* (*pulverulentia*, Latin.) Dustiness; abundance of dust.

**PULVIL**. *s.* (*pulvillum*, Latin.) Sweet scented powder (*Gay*).

To **PULVIL**. *v. a.* (from the noun.) To sprinkle with perfumes in powder (*Congreve*).

**PULVIS**, in medicine, a powder. The following are the chief:

**PULVIS ALOES CUM CANELLA**. A cathartic, deobstruent powder, possessing stimulating and aloeic properties.

**P. ALOES CUM FERRO**. This possesses aperient and deobstruent virtues; and is mostly given in chlorosis and constipation.

**P. ALOES CUM GUAIACO**. A warm aperient, laxative powder, calculated for the aged, and those affected with dyspeptic gout, attended with costiveness and spasmodic complaints of the stomach and bowels.

**P. ALUMINIS COMPOSITUS**. An astrigent and tonic compound, mostly exhibited in uterine hæmorrhages, and debility of the primæ viæ.

**P. ANTIMONIALIS**. This preparation is called in the new chemical nomenclature, phosphas calcis stibiatus. It is in high esteem as a febrifuge, sudorific, and antispasmodic; and, under the name of James's powder, has been long sold as a secret medicine. The diseases in which it is mostly exhibited are most species of asthenic and exanthematous fevers, acute rheumatism, gout, diseases arising from obstructed perspiration, dysuria, nervous affections, and spasms.

**P. AROMATICUS**. An elegant stimulant, carminative, and stomachic powder.

**P. ASARI COMPOSITUS**. This powder is used as an errhine in diseases of the head, or to promote sneezing, in order to rouse the actions of the system.

**P. CERUSSÆ COMPOSITUS**. This is mostly used in the form of collyrium, lotion, or injection, as a mucilaginous sedative.

**P. CHELARUM CANCRI COMPOSITUS**. An antacid and adstringent powder, mostly given to children with diarrhæa and acidity of the primæ viæ.

**P. CONTRAYERVÆ COMPOSITUS**. A febrifuge diaphoretic, mostly given in the dose of from one to two scruples in slight febrile affections.

**P. CRETÆ COMPOSITUS**. An astrigent, carminative, and stomachic powder exhibited in the cure of diarrhæa, pyrosis, and diseases arising from acidity of the bowels, inducing much pain.

**P. CRETÆ COMPOSITUS CUM OPIO**. The above powder, with the addition of opium, in the proportion of one grain to two scruples.

**P. IPECACUANHÆ COMPOSITUS**. A diaphoretic powder, similar to that of Dr. Dover, which gained such repute in the cure of rheumatism, and other diseases arising from obstructed perspiration and spasm.

**P. JALAPPÆ COMPOSITUS**. A saline purgative.

**P. MYRRHÆ COMPOSITUS**. A stimulant, antispasmodic, and emmenagogue powder, mostly exhibited in the dose of from fifteen grains to two scruples, in uterine obstructions and hysterical affections.

**P. OPIATUS**. An absorbent and anodyne.

**P. SCAMMONII COMPOSITUS**. From ten to fifteen grains are exhibited as a stimulating cathartic.

**PULVIS SCAMMONII CUM ALOE.** A stimulating cathartic, in the dose of from ten to fifteen grains.

**P. SCAMMONII CUM CALOMELANE.** A vermifugal cathartic, in the dose of from ten to twenty grains.

**P. SENNÆ COMPOSITUS.** A saline stimulating cathartic.

**P. TRAGACANTHÆ COMPOSITUS.** A very useful demulcent powder, which may be given in the dose of a drachm in coughs, diarrhæas, stranguy, &c.

**P. FULMINANS,** a fulminating powder; a solution of silver in nitric acid, precipitated by lime-water, and then dried and washed with a solution of pure ammonia. See **ARGENTUM.**

**PUMICE-STONE,** in mineralogy, a species of **LAVA**, which see.

**PUMMEL.** s. See **POMMEL.**

**PUMP,** a hydraulic machine for raising water by means of the pressure of the atmosphere. It would be an entertaining and not an uninteresting piece of information to learn the progressive steps by which the ingenuity of man has invented the various methods of raising water. A pump must be considered as the last step of this progress. Common as it is, and overlooked even by the curious, it is a very abstruse and refined invention. Nothing like it has been found in any of the rude nations whom the restless spirit of the Europeans has discovered, either in the new continent of America or the islands of the Pacific Ocean. Nay, it was unknown in the cultivated empire of China at the time of our arrival there by sea; and it is still a rarity every where in Asia, in places unfrequented by the Europeans. It does not appear to have been known by the Greeks and Romans in early times; and perhaps it came from Alexandria, where physical and mathematical science was much cultivated by the Greek school under the protection of the Ptolemies. The performances of Ctesibius and Hero are spoken of by Pliny and Vitruvius as curious novelties. It is perhaps not difficult to trace the steps by which those mechanicians were led to the invention. The Egyptian wheel was a common machine all over Asia, and is still in use in the remotest corners, and was brought by the Saracens into Spain, where it is still very common under its common name *noría*. The Danish missionaries found in a remote village in the kingdom of Siam the immediate offspring of the *noría* (*Lettres Edifiantes et Curieuses*). It was a wheel turned by an ass, and carrying round, not a string of earthen pots, but a string of wisps of hay, which it drew through a wooden trunk. This rude chain-pump was in frequent use for watering the rice fields. It is highly probable that it is of great antiquity, although we do not recollect its being mentioned by any of the Greek or Roman writers. The Arabs and Indians were nothing less than innovators; and we may suppose with great safety, that what arts we now find among them they possessed in very remote periods. Now the step from this to the pump is but short, though it is nice and refined; and the forcing pump of Ctesibius is the easiest and most natural.

Let **AB** (plate 145, fig. 4.) be the surface of the water in the well, and **D** the height where it is to be delivered. Let **DC** be a long wooden trunk, reaching as deep under water as possible. Let the rope **EF** be fitted with its knot of hay **F**. When it

is drawn up through the trunk, it will bring up along with it all the water lying between **C** and **A**, which will begin to run out by the spout **D** as soon as the knot gets to **G**, as far below **D** as **C** is below **A**. All this is very obvious; and it required but little reflection to be assured, that if **F** was let down again, or pushed down, by a rod instead of a rope, it would again perform the same office. Here is a very simple pump. And if it was ever put in practice, it behoved to show the supporting power of the atmosphere, because the water would not only be lifted by the knot, but would even follow it. The imperfection of this pump behoved to appear at first sight, and to suggest its remedy. By pushing down the knot **F**, which we shall henceforward call the piston, all the force expended in lifting up the water between **A** and **G** is thrown away, because it is again let down. A valve **G**, at the bottom, would prevent this. But then there must be a passage made for the water by the lateral tube **KBD** (fig. 5.). And if this be also furnished with a valve **H**, to prevent its losing the water, we have the pump of Ctesibius, as sketched in fig. 2. The valve is the great refinement: but perhaps even this had made its appearance before in the *noría*. For, in the more perfect kinds of these machines, the pots have a stop or valve in their bottom, which hangs open while the pot descends with its mouth downwards, and then allows it to fill readily in the cistern; whereas without the valve, it would occasion a double load to the wheel. If we suppose that the valve had made its appearance so early, it is not improbable that the common pump sketched in fig. 3 was as old as that of Ctesibius. In this place we shall first give a short description of the chief varieties of these engines, considering them in their simplest form, and we shall explain in very general terms their mode of operation. We shall then give a concise and popular theory of their operation, furnishing principles to direct us in their construction; and we shall conclude with the description of a few peculiarities which may contribute to their improvement or perfection.

There are but two sorts of pumps which essentially differ; and all the varieties that we see are only modifications of these. One of these original pumps has a solid piston; the other has a piston with a perforation and a valve. We usually call the first a forcing pump, and the second a lifting or sucking pump.

Fig. 5. is a sketch of the forcing pump in its most simple form and situation. It consists of a hollow cylinder, **ACc a**, called the working barrel, open at both ends, and having a valve **G** at the bottom, opening upwards. This cylinder is filled by a solid piston **EF**, covered externally with leather or tow, by which means it fits the box of the cylinder exactly, and allows no water to escape by its sides. There is a pipe **KHD**, which communicates laterally with this cylinder, and has a valve at some convenient place **H**, as near as possible to its junction with the cylinder. This valve also opens upwards. This pipe, usually called the rising pipe, or main, terminates at the place **D**, where the water must be delivered.

Now suppose this apparatus set into the water, so that the upper end of the cylinder may be under or even with the surface of the water **AB**; the water will open the valve **G**, and after filling the barrel and lateral pipe, will also open the valve **H**, and at last stand at an equal height within and without. Now let the piston be put in, at the top of the working barrel, and thrust down to **K**. It



will push the water before it. This will shut the valve G, and the water will make its way through the valve H, and fill a part B *b* of the rising pipe, equal to the internal capacity of the working barrel. When this downward motion of the piston ceases, the valve H will fall down by its own weight and shut this passage. Now let the piston be drawn up again: the valve H hinders the water in the rising pipe from returning into the working barrel. But now the valve G is opened by the pressure of the external water, and the water enters and fills the cylinder as the piston rises. When the piston has got to the top, let it be thrust down again: the valve G will again be shut, and the water will be forced through the passage at H, and rise along the main, pushing before it the water already there, and will now have its surface at L. Repeating this operation, the water must at last arrive at D, however remote, and the next stroke would raise it to *e*; so that during the next rise of the piston the water in *e* D will be running off by the spout.

The effect will be the same whatever is the position of the working barrel, provided only that it be under water. It may lie horizontally or sloping, or it may be with its mouth and piston rod undermost. It is still the same forcing pump, and operates in the same manner and by the same means, viz. the pressure of the surrounding water.

The external force which must be applied to produce this effect is opposed by the pressure exerted by the water on the opposite face of the piston. It is evident, from the common laws of hydrostatics, that this opposing pressure is equal to the weight of a pillar of water, having the face of the piston for its base, and the perpendicular height *d* A of the place of delivery above the surface of the water AB in the cistern for its height. The form and dimensions of the rising pipe are indifferent in this respect, because heavy fluids press only in the proportion of their perpendicular height. Observe that it is not *d* F, but *d* A, which measures this pressure, which the moving force must balance and surmount. The whole pressure on the under surface F *f* of the piston is indeed equal to the weight of the pillar *d* F *f* *b*; but part of this is balanced by the water AF *f* *a*. If indeed the water does not get into the upper part of the working barrel, this compensation does not obtain. While we draw up the piston, this pressure is removed, because all communication is cut off by the valve H, which now bears the whole pressure of the water in the main. Nay, the ascent of the piston is even assisted by the pressure of the surrounding water. It is only during the descent of the piston therefore that the external force is necessary. This however merely regards the state of equilibrium, and not that of actual working.

The simplest form and situation of the lifting pump is represented by the sketch fig. 6. The pump is immersed in the cistern till both the valve G and piston F are under the surface AB of the surrounding water. By this means the water enters the pump, opening both valves, and finally stands on a level within and without.

Now draw up the piston to the surface A. It must lift up the water which is above it (because the valve in the piston remains shut by its own weight); so that its surface will now be at *a*. A *a* being made equal to AF. In the mean time, the pressure of the surrounding water forces it into the working barrel, through the valve G; and the barrel is now filled with water. Now, let the piston be pushed down again; the valve G immediately

shuts by its own weight, and in opposition to the endeavours which the water in the barrel makes to escape this way. This attempt to compress the water in the barrel causes it to open the valve F in the piston: or rather, this valve yields to our endeavour to push the piston down through the water in the working barrel. By this means we get the piston to the bottom of the barrel; and it has now above it the whole pillar of water reaching to the height *a*. Drawing up the piston to the surface A a second time, must lift this double column along with it, and its surface now will be at *b*. The piston may again be thrust down through the water in the barrel, and again drawn up to the surface; which will raise the water to *c*. Another repetition will raise it to *d*; and it will now show itself at the intended place of delivery. Another repetition will raise it to *e*; and while the piston is now descending to make another stroke, the water in *e* *d* will be running off through the spout D; and thus a stream will be produced, in some degree continual, but very unequal. This is inconvenient in many cases: thus, in a pump for domestic uses, such a hobbling stream would make it very troublesome to fill a bucket. It is therefore usual to terminate the main by a cistern LMNO, and to make the spout small. By this means the water brought up by the successive strokes of the piston rises to such a height in this cistern, as to produce an efflux by the spout nearly equable. The smaller we make the spout D the more equable will be the stream; for when the piston brings up more water than can be discharged during its descent, some of it remains in the cistern. This, added to the supply of next stroke, makes the water rise higher in the cistern than it did by the preceding stroke. This will cause the efflux to be quicker during the descent of the piston, but perhaps not yet sufficiently quick to discharge the whole supply. It therefore rises higher next stroke: and at last it rises so high, that the increased velocity of efflux makes the discharge precisely balance the supply. Now the quantity supplied in each stroke is the same, and occupies the same room in the cistern at top; and the surface will sink the same number of inches during the descent of the piston, whether that surface has been high or low at the beginning. But because the velocities of the efflux are as the square roots of the heights of the water above the spout, it is evident that a sink of two or three inches will make a smaller change in the velocity of efflux when this height and velocity are great.

It is evident that the force necessary for this operation must be equal to the weight of the pillar of water *d* A A D, if the pipe be perpendicular. If the pump be standing aslope, the pressure which is to be balanced is still equal to the weight of a pillar of water of this perpendicular height, and having the surface of the piston for its base.

Such is the simplest, and, we may add, by far the best, form of the forcing and lifting pumps; but it is not the most usual. Circumstances of convenience, economy, and more frequently of fancy and habit, have caused the pump-makers to deviate greatly from this form. It is not usual to have the working barrel in the water; this, especially in deep wells, makes it of difficult access for repairs, and requires long piston rods. This would not do in a forcing pump, because they would bend.

We have supposed, in our account of the lifting pump, that the rise of the piston always terminated at the surface of the water in the cistern. This we did in order that the barrel might always be filled by the pressure of the surrounding water. But

## P U M P.

let us suppose that the rise of the piston does not end here, and that it is gradually drawn up to the very top: it is plain that the pressure of the atmosphere is by this means taken off from the water in the pipe (see PNEUMATICS), while it remains pressing on the water of the cistern. It will therefore cause the water to follow the piston as it rises through the pipe, and it will raise it in this way 33 feet at a medium. If, therefore, the spout D is not more than 33 feet above the surface of the water in the cistern, the pipe will be full of water when the piston is at D. Let it be pushed down to the bottom; the water will remain in the pipe, because the valve G will shut: and thus we may give the piston a stroke of any length not exceeding 33 feet. If we raise it higher than this, the water will not follow; but it will remain in the pipe, to be lifted by the piston, after it has been pushed down through it to the bottom.

But it is not necessary, and would be very inconvenient, to give the piston so long a stroke. The great use of a pump is to render effectual the reciprocation of a short stroke which we can command, while such a long stroke is generally out of our power. Suppose that the piston is pushed down only to  $b$ ; it will then have a column  $bf$  incumbent on it, and it will lift this column when again drawn up. And this operation may be repeated like the former, when the piston was always under water; for the pressure of the atmosphere will always cause the water to follow the piston to the height of 33 feet.

Nor is it necessary that the fixed valve G be placed at the lower orifice of the pipe, nor even under water. For, while things are in the state now described, the piston drawn up to  $f$ , and the whole pipe full of water; if we suppose another valve placed at  $b$  above the surface of the cistern, this valve can do no harm. Now let the piston descend, both valves G and  $b$  will shut. G may now be removed, and the water will remain supported in the space  $bG$  by the air; and now the alternate motions of the piston will produce the same effect as before.

We found in the former case that the piston was carrying a load equal to the weight of a pillar of water of the height AD, because the surrounding water could only support it at its own level. Let us see what change is produced by the assistance of the pressure of the atmosphere. Let the under surface of the piston be at  $b$ ; when the piston was at  $f$ , 33 feet above the surface of the cistern, the water was raised to that height by the pressure of the atmosphere. Suppose a partition made at  $b$  by a thin plate, and all the water above it taken away. Now pierce a hole in this plate. The pressure of the atmosphere was able to carry the whole column  $fa$ . Part of this column is now removed, and the remainder is not a balance for the air's pressure. This will therefore cause the water to spout up through this hole and rise to  $f$ . Therefore the under surface of this plate is pressed up by the contiguous water with a force equal to the weight of that pillar of water which it formerly supported; that is, with a force equal to the weight of the pillar  $fb$ . Now, the under surface of the piston, when at  $b$ , is in the same situation. It is pressed upwards by the water below it, with a force equal to the weight of the column  $fb$ ; but it is pressed downwards by the whole pressure of the atmosphere, which presses on all bodies; that is, with the weight of the pillar  $fa$ . On the whole, therefore, it is pressed downwards by a force equal to the difference of the weights of the pillars  $fa$

and  $fb$ ; that is, by a force equal to the weight of the pillar  $ba$ .

It may be conceived better perhaps in this way. When the piston was under the surface of the water in the cistern, it was equally pressed on both sides, both by the water and atmosphere. The atmosphere exerted its pressure on it by the intervention of the water; which being, to all sense, a perfect fluid, propagates every external pressure undiminished. When the piston is drawn up above the surface of the pit-water, the atmosphere continues to press on its upper surface with its whole weight, through the intervention of the water which lies above it; and its pressure must therefore be added to that of the incumbent water. It also continues to press on the under surface of the piston by the intervention of the water; that is, it presses this water to the piston. But, in doing this, it carries the weight of this water which it is pressing on the piston. The pressure on the piston therefore is only the excess of the whole pressure of the atmosphere above the weight of the column of water which it is supporting. Therefore the difference of atmospheric pressure on the upper and under surfaces of the piston is precisely equal to the weight of the column of water supported in the pipe by the air. It is not, however, the individual weight of this column that loads the piston; it is the part of the pressure of the atmosphere on its upper surface, which is not balanced by its pressure on the under surface.

In attempting therefore to draw up the piston, we have to surmount this unbalanced part of the pressure of the atmosphere, and also the weight of the water which lies above the piston, and must be lifted by it: and thus the whole opposing pressure is the same as before, namely, the weight of the whole vertical pillar reaching from the surface of the water in the cistern to the place of delivery. Part of this weight is immediately carried by the pressure of the atmosphere; but, in lieu of it, there is an equal part of this pressure of the atmosphere abstracted from the under surface of the piston, while its upper surface sustains its whole pressure.

So far, then, these two states of the pump agree. But they differ exceedingly in their mode of operation; and there are some circumstances not very obvious which must be attended to, in order that the pump may deliver any water at the spout D. This requires, therefore, a serious examination.

Let the fixed valve G (fig. 7.) be supposed at the surface of the cistern water. Let  $Mn$  be the lowest, and  $Nz$  the highest, positions of the piston, and let  $HA = h$  be the height of a column of water equiponderant with the atmosphere.

When the pump is filled, not with water, but with air, and the piston is in its lowest position, and all in equilibrio, the internal air has the same density and elasticity with the external. The space  $MA\ a m$ , therefore, contains air of the common density and elasticity. These may be measured by  $h$ , or the weight of a column of water whose height is  $h$ . Now, let the piston be drawn up to  $Nz$ . The air which occupied the space  $MA\ a m$  now occupies the space  $NA\ a n$ , and its density

is now  $\frac{MA\ a m}{NA\ a n}$ . Its elasticity is now diminished,

being proportionable to its density (see PNEUMATICS), and no longer balances the pressure of the atmosphere. The valve G will therefore be forced up by the water, which will rise to some height



# P U M P.

SA. Now, let the piston descend again to Mm. It cannot do this with its valve shut; for when it comes down so far as to reduce the air again to its common density, it is not yet at M, because the space below it has been diminished by the water which got into the pipe, and is retained there by the valve G. The piston valve, therefore, opens by the air which we thus attempt to compress, and the superfluous air escapes. When the piston has got to M, the air is again of the common density, and occupies the space MS sm. Now draw the piston up to N. This air will expand into the space NS sn, and its density will be reduced to  $\frac{MS sm}{NS sn}$ , and its elasticity will no longer balance

the pressure of the atmosphere, and more water will enter, and it will rise higher. This will go on continually. But it may happen that the water will never rise so high as to reach the piston, even though not 33 feet above the water in the cistern: for the successive diminutions of density and elasticity are a series of quantities that decrease geometrically, and therefore will have a limit. Let us see what determines this limit.

At whatever height the water stands in the lower part of the pipe, the weight of the column of water SA as, together with the remaining elasticity of the air above it, exactly balances the pressure of the atmosphere (see PNEUMATICS). Now the elasticity of the air in the space NS sn is equal to

$h \times \frac{MS sm}{NS sn}$ . Therefore, in the case where the

limit obtains, and the water rises no further, we

must have  $h = AS + h \frac{MS sm}{NS sn}$ , or, because the

column is of the same diameter throughout,  $h =$

$AS + h \frac{MS}{NS}$  and  $\frac{MS}{NS} h = h - AS$ , = HS, and

NS: MS = HA: HS, and NS-MS: NS = HA-HS: HA, or NM: NS = AS: AH, and NM × AH = NS × AS.—Therefore, if AN, the distance of the piston in its slightest position from the water in the cistern, and NM the length of its stroke, be given, there is a certain determined height AS to which the water can be raised by the pressure of the air: for AH is a constant quantity; and therefore when MN is given, the rectangle AS × SN is given. If this height AS be less than that of the piston in its lowest position, the pump will raise no water, although AN may be less than AH. Yet the same pump will raise water very effectually, if it be first of all filled with water; and we have seen professional engineers much puzzled by this capricious failure of their pumps. A little knowledge of the principles would have prevented their disappointment.

To insure the delivery of water by the pump, the stroke must be such that the rectangle MN × AH may be greater than any rectangle that can be made of the parts of AN, that is, greater than the square of half AN. Or, if the length of the stroke be already fixed by other circumstances, which is a common case, we must make AN so short that the square of its half, measured in feet, shall be less than 33 times the stroke of the piston.

Suppose that the fixed valve, instead of being at the surface of the water in the cistern, is at S, or any where between S and A, the performance of the pump will be the same as before: but if it be placed any where above S, it will be very dif-

ferent. Let it be at T. It is plain that when the piston is pushed down from N to M, the valve at T prevents any air from getting down; and therefore, when the piston is drawn up again, the air contained in the space MT tm will expand into the

space NT tn, and its density will be  $\frac{MT}{NT}$ . This is less than  $\frac{MS}{NS}$ , which expresses the density of

the air which was left in the space TS st by the former operations.—The air, therefore, in TS st will also expand, will open the valve, and now the water will rise above S. The proportion of NS to NT may evidently be such that the water will even get above the valve T. This diminishes the space NT tn; and therefore, when the piston has been pushed down to M, and again drawn up to N, the air will be still more rarefied, and the water will rise still higher. The foregoing reasoning, however, is sufficient to show that there may still be a height which the water will not pass, and that this height depends on the proportion between the stroke of the piston and its distance from the water in the cistern. We need not give the determination, because it will come in afterwards in combination with other circumstances. It is enough that the reader sees the physical causes of this limitation: and, lastly, we see plainly that the utmost security will be given for the performance of the pump, when the fixed valve is so placed that the piston, when in its lowest position, shall come into contact with it. In this case the rarefaction of the air will be the completest possible; and, if there were no space left between the piston and valve, and all were perfectly air-tight, the rarefaction would be complete, and the valve might be any thing less than 33 feet from the surface of the water in the cistern.

But this perfect contact and tightness is unattainable; and though the pump may be full of water, its continual downward pressure causes it to filtrate slowly through every crevice, and the air enters through every pore, and even disengages itself from the water, with which a considerable portion had been chemically combined. The pump by this means loses water, and it requires several strokes of brisk working to fill it again: and if the leathers have become dry, so much admission may be given to the air, that the pump will not fill itself with water by any working. It is then necessary to pour water into it, which shuts up these passages, and soon sets all to rights again. For these reasons, it is always prudent to place the fixed valve as low as other circumstances will permit, and to make the piston-rod of such a length, that when it is at the bottom of its stroke it shall be almost in contact with the valve. When we are not limited by other circumstances, it is evident that the best possible form is to have both the piston and the fixed valve under the surface of the water of the cistern. In this situation they are always wet and air-tight. The chief objection is, that by this disposition they are not easily come at when needing repair. This is a material objection in deep mines. In such situations, therefore, we must make the best compensation of different circumstances that we can. It is usual to place the fixed valve at a moderate distance from the surface of the water, and to have a hole in the side of the pipe, by which it may be got out. This is carefully shut up by a plate firmly screwed on, with leather or cement between the parts. This is called the *clack door*. It would, in every case,

be very proper to have a fixed valve in the lower end of the pipe. This would combine all advantages. Being always tight, the pipe would retain the water, and it would leave to the valve above it its full effect of increasing the rarefaction. A similar hole is made in the working barrel, a little above the highest position of the piston. When this needs repair, it can be got at through this hole, without the immense trouble of drawing up the whole rods.

Thus we have conducted the reader step by step, from the simplest form of the pump to that which long experience has at last selected as the most generally convenient. We might now proceed to detail the minute particulars in the construction of these pumps, as well as describe a variety of others: but as this would extend the present article beyond its assigned limits, we beg to refer the reader to Bossut's *Hydrodynamics*, Prony's *Hydraulic Architecture*, and Gregory's *Mechanics*, for much interesting information; and simply call his attention here to the two following varieties in the construction.

*Chain pump*, consists of a long chain, equipped with a sufficient number of valves, at proper distances, which working upon two wheels, one above and the other below, passes downward through a wooden tube, and returns upward through another. It is managed by a long winch or roller, whereon several men may be employed at once, and thus it discharges, in a limited time, a much greater quantity of water than the common pump, and with less fatigue and inconvenience to the labourers. This machine was formerly exposed to several disagreeable accidents, by nature of its then construction. The chain was of too complicated a fabric, and the spoked wheels, employed to wind it up from the ship's bottom, were deficient in a very material circumstance, viz. some contrivance to prevent the chain from sliding or jerking back upon the surface of the wheel, which frequently happened when the valves were charged with a considerable weight of water, or when the pump was violently worked. The links were evidently too short, and the unmechanical manner in which they were connected exposed them to a great friction in passing round the wheels. Hence they were sometimes apt to break or burst asunder in very dangerous situations, when it was extremely difficult, and sometimes impracticable to repair the chain. Of late, however, some considerable improvements have been made by Mr. Cole, under the direction of Captain Bentinck. The chain of this machine is more simple and mechanical, and less exposed to danger. It appears to have been first applied to the pump by Mr. Mylne, to exhaust the water from the caissons at Blackfriars Bridge. It was thence transferred to the marine by Captain Bentinck, after having received some material additions to answer that service. The principal superiority of this pump to the former is, 1. That the chain is more simple and easily worked, and consequently less exposed to injuries by friction. 2. That the chain is secured upon the wheel, and thereby prevented from jerking back when charged with a column of water. 3. That it may be easily taken up and repaired when broken or choked with ballast, &c. And, 4. That it discharges a much greater quantity of water with an inferior number of men. This has been proved by experience, when two men (instead of four) discharged a tun of water in fifty-five seconds.

*Double barrelled force pump*, is the same in principle as the ordinary forcing pump; only that two barrels are connected together for the advantage

of raising a constant stream of water. As the construction of a pump of this kind is important, we have appropriated the upper part of plate 124 to its explanation. Figs. 1 and 2 are plans, fig. 3 an elevation, fig. 4 a section, and figs. 5 and 6 separate figures of a valve of the pump (see Part 38). AA, figs. 1, 3, 4, are the barrels, which are bored out truly cylindrical: if the pump is small, the barrels are usually made of brass; but for larger work cast iron is used. They have a flanch or projecting ring at their lower ends to screw them to the rest of the pump. Each barrel is fitted with a piston or forcer, which consists of three metallic plates secured to a rod B, fig. 4: the middle plate is turned true and fitted as accurately as possible to the barrel: the upper and lower plates are somewhat smaller. Two round pieces of leather larger than the barrel are placed above and below the middle plate, being held fast between it and the upper and lower plates. When forced into the barrels these leathers turn up and down round the upper and lower plates, forming two cups of leather, which accurately fit the barrel, and will not permit any fluid to pass by them. The barrels are screwed down by their flanches to two chambers BD, shewn in plano in fig. 2, which are exactly similar to each other. They have each three apertures. The first is that by which they communicate with the barrel A; another immediately under this brings the water to the pump; and the third is that out of which the water issues when the forcer of the pump descends. HD, figs. 3 and 4, is the suction hamper which is common to both barrels: it has a pipe E from its lower part, terminating in a flanch to screw on the pipe to bring water to the pump. The upper flanch has two valves *gh*, fig. 2, in it, one under each barrel. One of these is shewn in the section fig. 4: it is made in the manner of figs. 5 and 6, where *aa* represents a brass ring turned out very true in the lathe, leaving a bar *b* across it, which is perforated with a hole to receive the spindle or tail of the valve *d*: the valve is fitted into the valve seat *aa* by grinding, so as to be perfectly air-tight, that it may retain any fluid which may pass through it. Another pair of these valves *ef*, fig. 2, is fitted into the chambers BD, and is covered by the forcing chamber I, which is exactly similar to the suction-piece. The parts of the pump are fastened together by screws and nuts, as will be understood by inspection of the figures. The whole pump is supported on two ground-cills GG by means of two iron bearers LL, screwed under the flanches of the pump and bolted down upon the ground-cills. The action of this pump is simple: when the piston or forcer of one barrel is raised, it causes a vacuum in it, and the pressure of the atmosphere forces the water up the suction-pipe (if not more than 30 or 33 feet), opens the valve *g* or *h* in the bottoms of the barrel, and fills it with water: on the descent of the forcer the lower valve shuts and the forcing valve *e* or *f* opens; the water the barrel contained is driven through it into the forcing chamber, and thence to any place whither the forcing pipe is carried. On the re-ascend of the forcer the lower valve opens, and the shutting of the forcing valve prevents the water returning into the barrel: the two forcers work up and down alternately, so that while one barrel is sending water up the force-pipe, the other is lifting it up the suction-pipe: in this manner the pump will raise a nearly constant stream of water if the forcers are worked in a proper manner, which is best done by means of cranks.



*Double Barrell'd Force Pump.*

*Fig. 1.*

*Plan.*

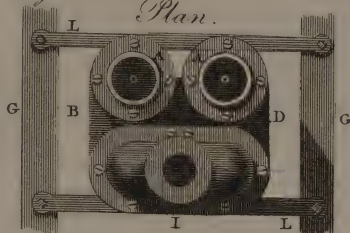
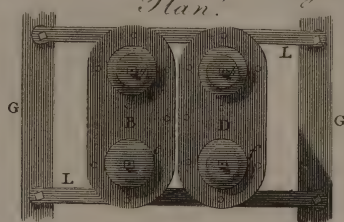


*Fig. 2.*

*Plan.*



*Elevation.*

*Fig. 3.*

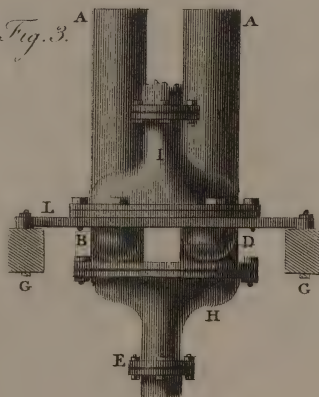


*Fig. 5.*

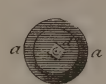


*Fig. 6.*

*Section.*

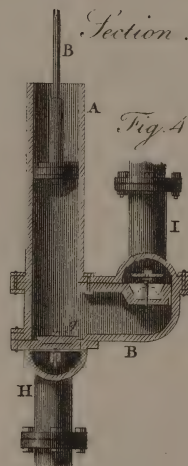


*Fig. 4.*

*Three Barrell'd*

*Lift Pump.*

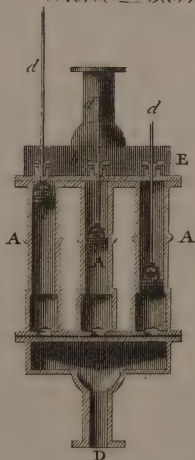


*Fig. 7.*

*Fig. 9.*

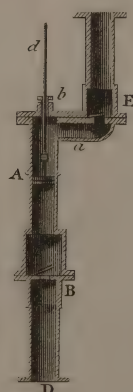


*Fig. 8.*





Figs. 7, 8, and 9, represent a *three-barrelled lift pump*, which differs from the force-pump in having the water drawn up through the barrel, instead of being taken in and forced out at the bottom again. AAA are the three barrels screwed upon the suction chamber B, which bring the water to them through the pipe D: from the top of each barrel a crooked passage *a*, fig. 8, proceeds, and the forcing chamber E covers them all. The top of each barrel is covered by a lid, containing a stuffing box *b*, which is a cavity to contain a piece of leather and a screw to hold it firmly round the pump rod *d*, that the water may not leak round the rod, though at the same time it may move freely up and down through the stuffing box. The bucket *e*, fig. 9, which is fixed to the pump rod *d*, is fitted round with leather that it may not leak, and contains a valve in it similar to those of the force-pump. In the bottom of each barrel a leather valve is placed closing a hole in the top of the suction chamber B, and preventing the return of any water that the barrel may contain. Another leather valve is placed over each of the passages *a*. When the pumps are full of water, by drawing up the bucket, its valve closes, and the water contained above the bucket is lifted through the valves in the forcing chamber E into the pipes: at the same time a vacuum is caused in the barrel below the piston, which causes the water to pass through the lower valve to refill it. On the descent of the bucket, its valve opens, and it passes down through the water which the barrel contains ready for another stroke. The forcing valves in E are not absolutely necessary to the operation of the pump, as the lower valves would retain the water in the barrels equally well; but they are useful as a security in case the lower valves should fail: and when the lids of the barrels are removed for the purpose of repairing the leather of the buckets, they prevent the descent of the water contained in the force-pipe. This pump, like the others, should be worked by means of cranks; but by having three barrels a more equable flow of water can be obtained than in a two-barrelled engine.

**PUMP (Air).** See **AIR-PUMP**.

**PUMP**, denotes also a shoe with a thin sole and low heel.

**To PUMP. v. n.** (*pompen*, Dutch.) To work a pump; to throw out water by a pump (*Deceit of Piety*).

**To PUMP. v. a.** 1. To raise or throw out as by means of a pump (*Blackmore*). 2. To examine artfully by sly interrogatories, so as to draw out any secrets (*Otway*).

**PUMPER. s.** (from *pump*.) The person or the instrument that pumps (*Boyle*).

**PUMPKIN**, or **PUMPKIN**, in botany. See **CUCURBITA**.

**PUN. s.** An equivocation; a quibble; an expression where a word has at once different meanings (*Addison*).

**To PUN. v. n.** (from the noun.) To quibble; to use the same word at once in different senses (*Dryden*).

**To PUNCH. v. a.** (*poingonner*, French.) To bore or perforate by driving a sharp instrument (*Wiseman*).

**PUNCH**, an instrument of iron or steel, used in several arts, for the piercing or stamping holes in plates of metals, &c. being so contrived as not only to perforate, but to cut out and

take away the piece. The punch is a principal instrument of the metal button-makers, shoe-makers, &c.

**PUNCH**, is also a name for a sort of compound drink, much used here, and in many parts abroad, particularly in Jamaica, and several other parts of the West Indies. Its basis is spring-water; which being rendered cooler, brisker, and more acid, with lemon or lime juice, and sweetened again to the palate with fine sugar, makes what they call sherbet; to which a proper quantity of spirituous liquor, as brandy, rum, or arrack, being added, the liquor becomes punch.

**PUNCH** signifies, 1. The buffoon or harlequin of the puppet-show (*Gay*). 2. In contempt or ridicule, a short fat fellow.

**PUNCHEON, PUNCHIN, or PUNCHION**, a little block or piece of steel, on one end whereof is some figure, letter, or mark, engraven either in creux or relievo, impressions whereof are taken on metal, or some matter, by striking it with a hammer on the end not engraven. There are various kinds of these puncheons used in the mechanical arts; such, for instance, are those of the goldsmiths, cutlers, pewterers, &c. The puncheon in coining, is a piece of iron steeled, whereon the engraver has cut in relievo the several figures, arms, effigy, inscription, &c. that there are to be in matrices, wherewith the species are to be marked. Minters distinguish three kinds of puncheons, according to the three kinds of matrices to be made; that of the effigy, that of the cross or arms, and that of the legend or inscription. The first includes the whole portrait in relievo; the second are small, such only containing a piece of the cross or arms; for instance, a fleur-de-lis, a harp, a coronet, &c. by the assemblage of all which the entire matrix is formed. The puncheons of the legend only contain each one letter, and serve equally for the legend on the effigy side and the cross side.

**PUNCHEON** is also used for several iron tools, of various sizes and figures, used by the engravers en creux on metals. Seal-engravers particularly use a great number for the several pieces of arms, &c. to be engraven, and many stamp the whole seal from a single puncheon.

**PUNCHEON**, is also a common name for all those iron instruments used by stone-cutters, sculptors, blacksmiths, &c. for the cutting, incising, or piercing their several matters. Those of sculptors and statuary serve for the repairing of statues when taken out of the moulds. The locksmiths use the greatest variety of puncheons; some for piercing hot, others for piercing cold; some flat, some square, some round, others oval, each to pierce holes of its respective figure in the several parts of locks.

**PUNCHEON**, in carpentry, is a piece of timber placed upright between two posts, whose bearing is too great; serving, together with them, to sustain some large weights. This term is also used for a piece of timber raised upright, under the ridge of a building, wherein the legs of a couple, &c. are jointed.

**PUNCHEON**, is also the name of a measure

for liquids. Rum is brought from the colonies in puncheons, which are large casks containing about 130 gallons.

**PUNCHER.** *s.* (from *punch*.) An instrument that makes an impression or hole (*Grew*).

**PUNCTA LACHRYMALIA**, in anatomy. Two small orifices, one of which is conspicuous in each eyelid, at the extremity of the tarsus, near the internal canthus.

**PUNCTATE LEAF.** Dotted leaf. See **PERFORATE**.

**PUNCTILIO.** *s.* A small nicety of behaviour; a nice point of exactness (*Addison*).

**PUNCTILIOUS.** *a.* (from *punctilio*.) Nice; exact; punctual to superstition (*Rog.*).

**PUNCTILIOUSNESS.** *s.* (from *punctilious*.) Nicety; exactness of behaviour.

**PUNCTO.** *s.* (*punto*, Spanish.) 1. Nice point of ceremony (*Bacon*). 2. The point in fencing (*Shakspeare*).

**PUNCTUAL.** *a.* (*punctuel*, French.) 1. Comprised in a point; consisting in a point (*Milton*). 2. Exact; nice; punctilious.

**PUNCTUALITY.** *s.* (from *punctual*.) Nicety; scrupulous exactness (*Howel*).

**PUNCTUALLY.** *ad.* (from *punctual*.) Nicely; exactly; scrupulously (*Ray*).

**PUNCTUALNESS.** *s.* (from *punctual*.) Exactness; nicety (*Felton*).

**PUNCTUATION**, the art of dividing a written composition into sentences, or parts of sentences, by points or stops, for the purpose of marking the different pauses which the sense requires.

The comma (,) represents the shortest pause; the semicolon (;) a pause double that of the comma; the colon (:) double that of the semicolon; and the period (.) double that of the colon. The precise duration of these pauses must depend on the degree of slowness or rapidity observed in reading; but the proportion between them should be ever invariable.

In order to determine clearly the application of the points, it is necessary to distinguish between a simple sentence and a compound sentence. A simple sentence contains only one finite verb: as, "Virtue refines the affections." A compound sentence has more than one finite verb expressed or implied, and therefore consists of two or more simple sentences connected together: as, "Virtue refines the affections; but vice debases them."

The comma is used to mark the pauses which occur in a simple sentence; the semicolon and the colon divide a compound sentence into the members which compose it; and the period is placed at the end of a sentence to denote that it is complete, and unconnected with that which follows.

In a simple sentence, when two or more words of the same sort, or belonging to the same part of speech, occur, they are parted by a comma: as, "Husband, wife, and children;" "open, generous, sincere;" "to read, mark, learn;" "to live soberly, righteously, and godly," &c.

Where the connection of the different parts

of a simple sentence is interrupted by necessary adjuncts, either to the subject or to the verb, the separation is generally marked by a comma: as, "To rouse mankind, when sunk in ignorance or superstition, and to encounter the rage of bigotry, armed with power, required the utmost vehemence of zeal, and a temper daring to excess."

The semicolon is used for dividing a compound sentence, and hence it occurs most generally in cases where the comma has preceded, and a greater pause is necessary: as, "Tribulation worketh patience; and patience, experience; and experience, hope." "He knew how to conciliate the most enterprising spirit, with the coolest moderation; the most obstinate perseverance, with the easiest flexibility; the most severe justice, with the greatest lenity; the greatest rigour in command, with the greatest affability of deportment; the highest capacity and inclination for science, with the most shining talents for action." In each of these examples the first clause forms a complete sentence, and what is expressed in it is understood in those which follow.

The colon divides a compound sentence into parts less connected than those which are separated by a semicolon. It may be properly applied in the three following cases:

1. When a member of a sentence is complete in itself, but is followed by some supplemental remark, or further illustration of the subject: as, "The knowledge of nature is only half the task of a poet: he must be acquainted likewise with all the modes of life."

2. When several semicolons have preceded: as, "Those who propagate evil reports frequently invent them; and it is no breach of charity to suppose this to be always the case; because no man who spreads detraction would scruple to produce it: and he who should diffuse poisons in a brook would scarce be acquitted of a malicious design, though he should allege that he received it of another who is doing the same elsewhere."

3. Where an example, a quotation, or a speech is introduced: as, "He was often heard to say: 'I have done with the world.'"

The period is employed to separate sentences which are not connected in construction; but it may be sometimes admitted, though they are joined by a copulative or disjunctive conjunction: as, "In passing judgment upon the characters of men, we ought to try them by the principles and maxims of their own age, and not by those of another. For, although virtue and vice are at all times the same, manners and customs vary continually."

Besides the points which mark the pauses in discourse, there are others, which denote a different modulation of voice in correspondence to the sense. These are,

The interrogation point ?

The exclamation point !

The parenthesis ( )

The interrogation and exclamation points are sufficiently explained by their names: they are indeterminate as to their duration, and may



in that respect be equivalent to a semicolon, a colon, or a period, as the sense requires. They generally mark an elevation of the voice.

The parenthesis is a clause introduced into the body of a sentence without affecting the construction. It marks a moderate depression of the voice, and may be marked with every point which the sense would require if the parenthetical characters were omitted. It ought to terminate with the same kind of stop which the member has that precedes it; and to contain that stop within the parenthetical marks: as, "He found them asleep again; (for their eyes were heavy;) neither knew they what to answer him."

Mr. J. Warburton has proved in the *Monthly Magazine* for September 1798, that the art of punctuation is not wholly modern, as many authors have affirmed. His proofs are as follows:

"Some species of pauses and divisions of sentences in speaking and writing must have been coeval with the knowledge of communicating ideas by sound or by symbols. Suidas says, that the period and the colon were discovered and explained by Thrasy-machus, about 380 years before the Christian era. Cicero says, that Thrasy-machus was the first who studied oratorical numbers, which entirely consisted in the artificial structure of periods and colons. It appears from a passage in Aristotle, that punctuation was known in his time. The learned Dr. Edward Bernard refers the knowledge of pointing to the time of that philosopher, and says, that it consisted in the different positions of one single point. At the bottom of a letter, thus, (A.) it was equivalent to a comma: in the middle (A.) it was equal to a colon; at the top (A) it denoted a period, or the conclusion of a sentence.

"This mode was easily practised in Greek manuscripts, while they were written in capitals. But when the small letters were adopted, that is, about the 9th century, this distinction could not be observed; a change was therefore made in the scheme of punctuation. 'Unciales literas hodierno usu dicimus eas in vetustis codicibus, quæ priscam formam servant, ac solutæ sunt, nec mutuo colligantur. Hujus modi literæ unciales observantur in libris omnibus ad nonum usque sæculum.'—*Montf. Palæog. Recens.* p. xii.

"According to Cicero, the ancient Romans, as well as the Greeks, made use of points. He mentions them under the appellation of 'librariorum notæ;' and in several parts of his works he speaks of 'interpunctæ clausulæ in orationibus,' of 'clausulæ atque interpuncta verborum,' of 'interpunctiones verborum,' &c.

"Seneca, who died A. D. 65, expressly says, that Latin writers, in his time, had been used to punctuation. 'Nos, cum scribimus interpungere consuevimus.' Muretus and Lipsius imagined that these words alluded to the insertion of a point after each word: but they certainly were mistaken; for they must necessarily refer to marks of punctuation in the division of sentences, because in the passage in which these

words occur, Seneca is speaking of one Q. Haterius, who made no pauses in his orations.

"According to Suetonius, in his *Illust. Gram.* Valerius Probus procured copies of many old books, and employed himself in correcting, pointing, and illustrating them; devoting his time to this and no other part of grammar. 'Multa exemplaria contracta emendare, ac distinguere et adnotare curavit; soli huit, nec ulli præterea, grammatices parti deditus.'

"It appears from hence, that in the time of Probus, or about the year 68, Latin manuscripts had not been usually pointed, and that grammarians made it their business to supply this deficiency.

"Quintilian, who wrote his celebrated treatise on oratory, about the year 88, speaks of commas, colons, and periods; but it must be observed, that by these terms he means clauses, members, and complete sentences, and not the marks of punctuation.

"Ælius Donatus published a treatise on grammar in the 4th century, in which he explains the distinctio, the media distinctio, and the subdistinctio; that is, the use of a single point in the various positions already mentioned.

"Jerom, who had been the pupil of Donatus, in his Latin Version of the Scriptures, made use of certain distinctions or divisions, which he calls cola and commata. It has, however, been thought probable, that these divisions were not made by the addition of any points or stops; but were formed by writing, in one line, as many words as constituted a clause, equivalent to what we distinguish by a comma or a colon. These divisions were called *στίχοι* or *ῥήματα*; and had the appearance of short irregular verses in poetry. There are some Greek manuscripts still extant, which are written in this manner."

**TO PUNCTULATE.** *v. n.* (*punctulum*, Latin.) To mark with small spots (*Woodward*).

**PUNCTUM DUPLEX** (Double point), in the higher geometry, a point where two branches of a curve intersect each other. See **CURVE**, **LEMNISCATE**, &c.

**PUNCTURE.** *s.* (*punctus*, Lat.) A small prick; a hole made with a very sharp point (*Brown*).

**PUNBLE.** *s.* A short and fat woman (*Ain.*).

**PUNDITS**, or **PENDITS**, learned Bramins devoted to the study of the Shanscrit language, and to the ancient science, laws, and religion of Hindustan.

**PUNGENCY.** *s.* (from *pungent*.) 1. Power of pricking (*Arbutnot*). 2. Heat on the tongue; acridness. 3. Power to pierce the mind (*Hammond*). 4. Acrimoniousness; keenness (*Stillingfleet*).

**PURGENT.** *a.* (*purgens*, Latin.) 1. Pricking (*Pope*). 2. Sharp on the tongue; acrid (*Newton*). 3. Piercing; sharp (*Swift*). 4. Acrimonious; biting (*Dryden*).

**PUNICA.** Pomegranate tree. In botany, a genus of the class icosandria, order monogynia. Calyx superior, five-cleft; petalless;

pome many-celled, many-seeded. Two species, as follow :

1. *P. granatum*. Common pomegranate tree. Stem arboreous, eighteen or twenty feet high, armed with a few thorns; leaves lanceolate; flowers terminal, scarlet; fruit a pome-berry, covered with a hard coriaceous rind including a pulp. A native of the South of Europe. The bark, under the name of *granatum*, is used as an astringent in medicine. See *GRANATUM*.

2. *P. nana*. Dwarf pomegranate. Stem shrubby, five or six feet high; leaves linear; flower smaller than in the preceding; fruit not larger than a nutmeg, and of little flavour. A native of the Antilles.

Both sorts are cultivated, and may be best increased by layers: the former will bear the external atmosphere; the second requires the warmth of a greenhouse.

**PUNICEOUS.** *a.* (*punicus*, Latin.) Purple.

**PUNICUM BELLUM.** The first Punic war was undertaken by the Romans against Carthage, B. C. 264, and the ambition of Rome gave origin to it. For upwards of 240 years, the two nations had beheld with secret jealousy each other's power, when Sicily, an island of the highest consequence to the Carthaginians, as a commercial nation, became the seat of the first dissensions. From a private quarrel the war became general. The Romans obtained a victory in Sicily, but, as their enemies were masters at sea, the advantages they gained were inconsiderable. To make themselves equal to their adversaries, they aspired to the dominion of the sea, and in 60 days timber was cut down, and a fleet of 120 gallees completely manned and provisioned. The successes they met by sea were trivial. Duilius at last obtained a victory, and was the first Roman who ever received a triumph after a naval battle. The Carthaginians sued for peace, and the Romans, whom an unsuccessful descent upon Africa, under Regulus (see *REGULUS*), had rendered diffident, listened to the proposal, and the first Punic war was concluded B. C. 241. After this, the Carthaginians, who had lost, by the treaty of peace, the dominion of Sardinia and Sicily, made new conquests in Spain, and soon began to repair their losses by industry and labour. The Romans, not insensible of their successes in Spain, stipulated with them not to cross the Iberus, or molest the cities of the Saguntines. This was for some time observed, but, when Annibal succeeded to the command of the Carthaginian armies in Spain, he took Saguntum, whereupon complaints were carried by the Romans to Carthage, and war was determined upon, by the influence of Annibal in the Carthaginian senate. Without delay, B. C. 218, Annibal marched an army of 90,000 foot and 12,000 horse towards Italy. For the farther operations of this war, which was terminated 201 B. C. (see *ANNIBAL* and *SCIPIO*.) During the 50 years which followed the conclusion of the second Punic war, the Carthaginians were

employed in repairing their losses by unwearied application, but they found still in the Romans a jealous rival, and in Masinissa, the ally of Rome, an intriguing monarch. The king of Numidia made himself master of one of their provinces; but, as they were unable to make war without the consent of Rome, the Carthaginians sought relief by embassies, and made continual complaints in the Roman senate of the tyranny of Masinissa. Commissioners were appointed to examine the cause of their complaints; but the interest of the Carthaginians was neglected. Upon this the Carthaginians entered the field against the Numidians, and were defeated in a bloody battle by Masinissa, then 90 years old. By this bold measure they had broken the peace, and when the news of Masinissa's victory reached Italy, forces were sent to Sicily, and from thence ordered to pass into Africa. The Romans acted with the deepest policy: no declaration of war had been made, though hostilities appeared inevitable; and, on their arrival, demanded of the Carthaginians that they should deliver into their hands 300 hostages, all children of senators, and of the most noble and respectable families, all their ships, their arms, engines of war, with all their naval and military stores. To this rigid requisition the Carthaginians submissively agreed. But when they were told, that, to avoid hostilities, they must leave their ancient habitations, and retire into the inland parts of Africa, and found another city, at the distance of not less than ten miles from the sea, they determined to sacrifice their lives for the protection of the place which had given them birth. A regular siege then began, and two years were spent in useless operations, when Scipio, the descendant of the great Scipio, who finished the second Punic war, was sent to conduct the siege. The vigour of his operations soon baffled the efforts of the besieged. Despair and famine now raged in the city, and having at length carried the fortifications, he set fire to the houses. During 17 days, Carthage was in flames, 147 B. C. This remarkable event happened about the year of Rome 606, and the news of this victory caused the greatest rejoicings at Rome. Commissioners were appointed by the Roman senate, not only to raze the walls of Carthage, but even to demolish and burn the very materials with which they were made; and in a few days, that city, which had been once the seat of commerce, and one of the most powerful states of the world, left behind no traces of its splendour, its power, or even of its existence.

**PUNINESS.** *s.* (from *puny*.) Pettiness; smallness.

**TO PUNISH.** *v. a.* (*punio*, Latin.) 1. To chastise; to afflict with penalties or death for some crime (*Leviticus*). 2. To revenge a fault with pain or death.

**PUNISHABLE.** *a.* (*punissable*, Fr.; from *punish*.) Worthy of punishment; capable of punishment (*Taylor*).

**PUNISHABLENESS.** *s.* (from *punish*.)



*able*.) The quality of deserving or admitting punishment.

**PUNISHER.** *s.* (from *punish*.) One who inflicts pains for a crime (*Milton*).

**PUNISHMENT,** a penalty imposed upon the commission of some crime or offence against the laws.

It is essential to the nature of a law, that it import or decree a punishment to the transgressors thereof.

The forms and manners of punishment are various in various countries and ages, and for various crimes; as treason, felony, adultery, parricide, &c.

Among the Romans, the pecuniary punishments were the *multa* and *confisatio*. The corporal punishments were, *capitis diminutio*, *aquæ et ignis interdictio*, *proscriptio*, *deportatio*, *relegatio*, *furca*, *crux*, *carcer*, *culeus*, *equuleus*, *scalæ gemonæ*, *damnatio ad gladium*, *ad metallum*, *flagellatio*, *talio*, &c. which see described under their respective articles.

Among us the principal civil punishments are fines, imprisonments, the stocks, pillory, burning in the hand, whipping, ducking-stool, hanging, beheading, quartering, burning, transportation, &c.

The ecclesiastical punishments are censures, suspensions, deprivations, degradations, excommunications, anathemas, penances, &c. The military punishments are, being shot, running the gantelope, riding the wooden horse, the bilboes, &c. Among the Turks, &c. impaling, bastinadoes on the soles of the feet, &c. obtain.

The only two legitimate ends of human punishments seem to be the reformation of criminals, and the deterring of others from the commission of like crimes. For remarks on this subject, so important to all legislators, see the works of Montesquieu, Beccaria, Bentham, and Basil Montague.

The following return of commitments and trials in London and Middlesex, for five years, from 1805 to 1809, has been presented to the House of Commons, viz.

Committed. Indicted. Convicted.

|                |                |                |     |
|----------------|----------------|----------------|-----|
| 1805 . . . . . | 980 . . . . .  | 951 . . . . .  | 558 |
| 1806 . . . . . | 899 . . . . .  | 855 . . . . .  | 475 |
| 1807 . . . . . | 1017 . . . . . | 980 . . . . .  | 542 |
| 1808 . . . . . | 1110 . . . . . | 1074 . . . . . | 619 |
| 1809 . . . . . | 1242 . . . . . | 1197 . . . . . | 750 |

The return of trials, &c. for all England, in the year 1809, was as follows:

Commit. Indict. Convict. Exec.

|                                         |            |           |           |    |
|-----------------------------------------|------------|-----------|-----------|----|
| Home Circuit . . .                      | 368 . . .  | 332 . . . | 205 . . . | 17 |
| Oxford ditto . . .                      | 269 . . .  | 262 . . . | 154 . . . | 2  |
| Western ditto . . .                     | 267 . . .  | 253 . . . | 152 . . . | 4  |
| Midland ditto . . .                     | 223 . . .  | 214 . . . | 134 . . . | 4  |
| Norfolk ditto . . .                     | 121 . . .  | 118 . . . | 70 . . .  | 3  |
| Northern ditto . . .                    | 108 . . .  | 98 . . .  | 49 . . .  | 7  |
| N. Wales ditto . . .                    | 1 . . .    | 1 . . .   | — . . .   | —  |
| Brecon ditto . . .                      | 10 . . .   | 10 . . .  | 5 . . .   | —  |
| Cardiff ditto . . .                     | 18 . . .   | 15 . . .  | 4 . . .   | —  |
| Lancashire do. . .                      | 105 . . .  | 96 . . .  | 52 . . .  | 13 |
| Durham . . . . .                        | 8 . . .    | 5 . . .   | 2 . . .   | —  |
| London and Middlesex } Sess. 1242 . . . | 1197 . . . | 750 . . . | 7         |    |

**PUNITION.** *s.* (*punition*, French; *punitio*, Latin.) Punishment (*Ainsworth*).

**PUNITIVE.** *a.* (from *punio*, Lat.) Awarding or inflicting punishment (*Hammond*).

**PUNITORY.** *a.* (from *punio*, Latin.) Punishing; tending to punishment.

**PUNK.** *s.* A whore; a common prostitute (*Shakspeare*).

**PUNSTER.** *s.* (from *pun*.) A quibbler; a low wit who endeavours at reputation by double meaning (*Arbutnot*).

**To PUNT.** *v. a.* To play at basset and ombre (*Addison*).

**PUNTA DEL GUDA**, the capital of St. Michael, one of the Azores, with a strong castle. It is situate on the S. side, and contains 12,000 inhabitants. The streets are regular, and of convenient width; and the churches, religious houses, and public edifices may be deemed elegant. There is no harbour in the vicinity of the town, and vessels usually anchor at a distance from the shore in an open road. Lon. 25. 42 W. Lat. 37. 47 N.

**PUNY.** *a.* (*puis ne*, French.) 1. Young. 2. Inferiour; petty; of an under rate (*Shakspeare*).

**PUNY.** *s.* A young and unexperienced unseasoned wretch (*South*).

**To PUP.** *v. n.* (from *puppy*.) To bring forth whelps: used of a bitch bringing young.

**PUPIENUS** (Marcus Claudius Maximus), a man of an obscure family, who raised himself by his merit to the highest offices in the Roman armies. His father was a blacksmith. After the death of the Gordians, Pupienus was elected with Balbinus to the imperial throne, and immediately marched against the Maximini, but being informed that they had been sacrificed to the fury of their own soldiers, he retired to Rome. He soon after prepared to make war against the Persians, who insulted the majesty of Rome, but was prevented, and was massacred, A. D. 236, by the pretorian guards. Balbinus shared his fate. He was esteemed the constant friend of justice, moderation, and clemency.

**PUPIL.** *s.* (*pupillus*, Latin.) 1. A scholar; one under the care of a tutor (*Locke*). 2. A ward; one under the care of a guardian (*Dryden*).

**PUPIL.** (from *pupa*, a babe; because it reflects the diminished image of the person who looks upon it like a puppet.) The round opening in the middle of the iris, in which we see ourselves in the eye of another. See **EYE**.

**PUPILAGE.** *s.* (from *pupil*.) 1. State of being a scholar (*Locke*). 2. Wardship; minority (*Spenser*).

**PUPILARY.** *a.* (*pupillaris*, Latin.) Pertaining to a pupil or ward.

**PUPILLA.** See **PUPIL**.

**PUPPET.** *s.* (*poupée*, French; *pupus*, Latin.) 1. A small image moved by wire in a mock drama; a wooden tragedian (*Pope*). 2. A word of contempt (*Shakspeare*).

**PUPPETMAN.** *s.* (*puppet* and *man*.) Master of a puppetshow (*Swift*).

**PUPPETSHOW.** *s.* (*puppet* and *show*.) A

mock drama performed by wooden images moved by wire (*Swift*).

**PUPPY**. *s.* (*poupée*, French.) 1. A whelp; progeny of a bitch (*Gay*). 2. A name of contemptuous reproach to a man (*Shakspeare*).

**TO PUPPY**. *v. a.* (from the noun.) To bring whelps.

**PURBACH** (George), a German, eminent as a divine and philosopher. He made several astronomical observations, for the improvement of which he invented some instruments, and calculated useful tables. He translated Ptolemy's almagest, and died at Vienna 1462, aged 39. An interesting account of this eminent man is given in Dr. Hutton's Mathematical Dictionary.

**PURBECK** (Isle of), a rough and heathy tract in Dorsetshire, to the S. of Poole bay. It is insulated by the sea and rivers, and is famous for its stone quarries. The principal of these lie at its eastern extremity, near Swanage, whence the stone is exported. It is of the calcareous kind, but distinguished into numerous sorts, the finest of which deserve the name of marble, and are used for chimneypieces, hearths, &c. The coarser kinds are made use of in paving. Tobacco-pipe clay is dug up in several parts of this island, the finest near Corfe castle, of which much is exported, particularly for the Staffordshire potteries.

**PURBLIND**. *a.* (corrupted from *poreblind*.) Nearsighted; shortsighted (*Shakspeare*).

**PURBLINDNESS**. *s.* Shortness of sight.

**PURCELL** (Henry), a celebrated musical composer, born in 1658. At 18 he was organist of Westminster, and in 1682 was made one of the organists of the chapel royal. He published some sonatas and anthems, and divided his services between the church and the theatre. Dryden, some of whose poetry he set to music, has highly complimented his powers. He died of a consumptive disorder, 1695. His works were published by subscription, under the title of Orpheus Britannicus, 1698. His brother Daniel, a famous punster, was organist of Magdalen college, Oxford, and of St. Andrew's, Holborn.

**PURCHASABLE**. *a.* (from *purchase*.) That may be purchased, bought, or obtained (*Locke*).

**TO PURCHASE**. *v. a.* (*purchasser*, Fr.) 1. To acquire, not inherit. 2. To buy for a price (*Shakspeare*). 3. To obtain at any expence, as of labour or danger (*Milton*). 4. To expiate or recompense by a fine or forfeit (*Shaksp.*).

**PURCHASE**. *s.* (*pourchas*, old French.) 1. Any thing bought or obtained for a price (*Locke*). 2. Any thing of which possession is taken any other way than by inheritance (*Shakspeare*).

**PURCHASER**. *s.* (from *purchase*.) A buyer; one that gains any thing for a price (*Addison*).

**PURE**. *a.* (*pur*, *pure*, French; *purus*, Lat.) 1. Clear; not dirty; not muddy (*Sidney*). 2. Not filthy; not sullied (*Proverbs*). 3. Unmingled; not altered by mixtures (*Tay.*). 4. Genuine; real; unadulterated (*James*). 5.

Not connected with any thing extrinsic: as, pure mathematics (*Watts*). 6. Free; clear (*Philips*). 7. Free from guilt; guiltless; innocent (*Milton*). 8. Incorrupt; not vitiated by any bad practice or opinion (*Ticket*). 9. Not vitiated with corrupt modes of speech (*Ascham*). 10. Mere: as, a pure villain (*Clarendon*). 11. Chaste; modest: as, a pure virgin.

**PURELY**. *ad.* (from *pure*.) 1. In a pure manner; not dirtily; not with mixture (*Isa.*). 2. Innocently; without guilt. 3. Merely; completely; totally (*Clarendon*).

**PURENESS**. *s.* (from *pure*.) 1. Clearness; freedom from extraneous or foul admixtures (*Temple*). 2. Simplicity; exemption from composition (*Dryden*). 3. Innocence; freedom from guilt (*Common Prayer*). 4. Freedom from vitious modes of speech (*Ascham*).

**PURFILE**. *s.* (*pourfilée*, French.) A sort of ancient trimming for women's gowns (*Bailey*).

**TO PURFILE**. *v. a.* (*pourfiler*, French.) To decorate with a wrought or flowered border (*Spenser*).

**PURFILE**. *s.* (*pourfilée*, Fr.) A border of embroidery.

**PURGATION**. *s.* (*purgation*, French.) 1. The act of cleansing or purifying from vitious mixtures (*Burnet*). 2. The act of cleansing the body by downward evacuation (*Bacon*). 3. The act of clearing from imputation of guilt.

**PURGATIVE**. *a.* (*purgatif*, Fr. *purgativus*, Lat.) Cathartic; having the power to cause evacuation downward (*Bacon*).

**PURGATORY**, a place in which the just, who depart out of this life, are supposed to expiate certain offences which do not merit eternal damnation. Broughton has endeavoured to prove that this notion has been held by Pagans, Jews, and Mahometans, as well as by Christians; and that in the days of the Macca-bees the Jews believed that sin might be expiated by sacrifice after the death of the sinner, cannot be questioned.

Much abuse has been poured upon the church of Rome for her doctrine of purgatory, and many false representations have been made of the doctrine itself. The following view of it is taken from a work which is considered as a standard by the British Catholics. 1. Every sin, how slight soever, though no more than an idle word, as it is an offence to God, deserves punishment from him, and will be punished by him hereafter, if not cancelled by repentance here. 2. Such small sins do not deserve eternal punishment. 3. Few depart this life so pure as to be totally exempt from spots of this nature, and from every kind of debt due to God's justice. 4. Therefore few will escape without suffering something from his justice for such debts as they have carried with them out of this world; according to that rule of divine justice, by which he treats every soul hereafter according to its works, and according to the state in which he finds it in death. From these propositions, which the Papist con-



siders as so many self-evident truths, he infers that there must be some third place of punishment; for, since the infinite goodness of God can admit nothing into heaven which is not clean and pure from all sin both great and small; and his infinite justice can permit none to receive the reward of bliss, who as yet are not out of debt, but have something in justice to suffer; there must of necessity be some place or state, where souls departing this life, pardoned as to the eternal guilt or pain, yet obnoxious to some temporal penalty, or with the guilt of some venial faults, are purged and purified before their admittance into heaven. And this is what he is taught concerning purgatory. Which, though he knows not where it is, of what nature the pains are, or how long each soul is detained there; yet he believes, that those that are in this place, being the living members of Jesus Christ, are relieved by the prayers of their fellow members here on earth, as also by alms and masses offered up to God for their souls. And as for such as have no relations or friends to pray for them, or give alms, or procure masses for their relief; they are not neglected by the church, which makes a general commemoration of all the faithful departed in every mass, and in every one of the canonical hours of the divine office.

Such is the Popish doctrine of purgatory, which is built chiefly upon 2 Macc. xii. 43, 44, 45; St. Matth. xii. 31, 32; and 1 Cor. iii. 15. By Protestants the books of Maccabees are not acknowledged to be inspired scripture; but if they were, the texts referred to would rather prove that there is no such place as purgatory, since Judas did not expect the souls departed to reap any benefit from his sin-offering till the resurrection. Our Saviour, in St. Luke, speaks of remission in this world and in the world to come; but surely neither of these is purgatory. The world to come is the state after the resurrection, and the remission spoken of is the sentence of absolution to be pronounced on the penitent from the seat of general judgment.

**TO PURGE.** *v. a.* (*purgo*, Latin.) 1. To cleanse; to clear (*Bacon*). 2. To clear from impurities (*Woodward*). 3. To clear from guilt (*Hebrews*). 4. To clear from imputation of guilt (*Shakspeare*). 5. To sweep or put away impurities (*Decay of Piety*). 6. To evacuate the body by stool (*Camden*). 7. To clarify; to defecate.

**TO PURGE.** *v. n.* 1. To grow pure by clarification. 2. To have frequent stools.

**PURGE.** *s.* A cathartic medicine; a medicine that evacuates the body by stool (*Arbuthnot*).

**PURGER.** *s.* (from *purge*.) 1. One who clears away any thing noxious (*Shakspeare*). 2. Purge; cathartic (*Bacon*).

**PURGING;** an evacuation procured from the intestines by means of cathartic substances.—It is often had recourse to both as a preventive and as a cure for diseases actually existing. As a preventive it is also frequently employed in veterinary practice. So serviceable indeed is it to

cattle of various kinds and especially to horses, that a season for purging is deemed almost as necessary as a season for work. Mr. Clark of Edinburgh, in his Treatise on the prevention of diseases in horses, has well described the principles on which purgative medicines should be exhibited. "The action of purging," he observes, "consists in irritating the sensible fibres of the stomach and intestines, by which means, not only the peristaltic motions of the latter are considerably quickened, but also the secretions of mucous and lymphatic juices, and vapours, which ooze every where into the cavities of the intestines, are increased, together with unusual quantities of pancreatic juice and bile from their several sources; hence it will be obvious, how great a quantity of the soundest humours, or even the chyle that is derived from the food, before it is mixed with the blood, may be carried off by purging medicines, and how much the whole mass of fluids, in general, may be decreased and drawn off.

"Since, therefore, purging is occasioned by giving such medicines as are found, by their irritating quality, to stimulate the coats of the stomach and guts, and, at the same time, quicken the peristaltic motion of the latter, so as to cause them to shake or throw off their contents by stool, it would appear, that the different kinds of purging medicines differ only in degrees of strength, and that they operate no otherwise upon the different humours of the body than as they stimulate the first passages more or less, and hence cause a greater or lesser evacuation by stool. So that, by this operation, we only lessen the quantity of the fluids, and clear or scour the first passages from any offending matters that may be lodged there. From hence it may likewise be inferred, that there is no such thing as elective purgation, that is, by giving certain medicines, we drain off this or that particular humour from the body. This may be further illustrated in the following case or example. When a horse, that has swelled legs or greasy heels, gets purging medicines, they do not act immediately on the fluids contained in the legs, by carrying them off only, they act by revulsion, that is, by drawing away the fluids, &c. from the stomach and intestines; those that are in the legs are, at the same time, absorbed or drawn away from the extremities by the absorbent vessels, to supply the want in the former; and hence the swelling in the legs, &c. subsides."

Our author, in the introductory part of his chapter, having taken notice of the great length of the intestines in the horse, says, "This, together with the horizontal or prone position of the body of a horse, is unfavourable to the operation of purging medicines, which, on that account, remain in the intestines a considerable time before they operate, being from 18 to 28 or 30 hours, according to the state of the bowels at the time, and, in some constitutions, even longer. In these cases, it is not advisable to give any medicines in order to quicken or hasten their operation; walking exercise, but not long continued at a time; together with plenty of warm water, if the horse will drink, is the best and safest means to forward their operation. At the same time, it will be necessary to notice whether the horse stales more than usual, as purging medicines are found sometimes to operate in that way, without any considerable evacuation by dung."

A proper caution in giving purging balls, is, "that the operator should push the ball over the roof of the tongue, and that he be certain of the

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ball's being swallowed entire, and not broken or thrown out of the mouth. Mistakes of this kind have frequently occurred: when the ball breaks, one-half, perhaps, is only swallowed, the other drops out of the mouth, or it may happen that the whole ball drops out unperceived. In these cases, it is concluded, from the purge not operating in due time, that it has been too weak, and therefore the next dose is made considerably stronger, and hence a superpurgation ensues, attended with great sickness, loss of strength, and other bad consequences. Therefore, when purging balls are given to horses, the head should be kept up, and care taken that the ball passes down the gullet, which may easily be discovered sliding down from the outside; but, if any doubt remains of its being swallowed, a little water may be given the horse to drink, and one gulp or two will put it out of all doubt."

In adverting to the common practice of giving purging balls upon an empty stomach, our author observes that this, in some constitutions, occasions great sickness, faintness, griping, &c. long before they begin to operate. To prevent which he recommends a mash of bran to be given about an hour or more before the ball, which contributes to the effects of the purge, and causes it to operate in the most gentle and easy manner.

"Another error," continues he, "which many people fall into is, that although a purge operates very well, yet, if the horse is not very sick during its operation, they conclude that it will not be of any benefit to him; and they therefore give the next purge made a good deal stronger, in order, as they say, to stir up the humours; for they conclude that the sicker a horse is under this operation, the humours are the more stirred up, and the easier carried off by the purge, without considering the danger to which they expose the animal.

"When purging medicines are intended to be given to horses, it is necessary that they should be kept quiet and at rest for some time before, that is, from any very violent exercise; and the same rule should be observed for some days after their operation is over, walking exercise only excepted. It is owing to the want of these, and such-like precautions, already mentioned, that so many accidents happen daily in the purging of horses."

Having proceeded thus far, our author next considers that part of the subject which relates to the practice of purging horses, by way of preparing them for running, hunting, &c. "It must be acknowledged," says he, "there is a difficulty in combating a practice which too generally prevails, although there are a number of facts which will serve to demonstrate, that the purging of horses indiscriminately is not necessary in order to prepare them for these active exercises. On the contrary, it must, and indeed is, in many cases, exceedingly hurtful, on account of the too frequent repetition of them, together with the too short intervals generally allowed between each purgation.

"It is well known, that horses, by good feeding, regular exercise, &c. may be brought to perform the most active exercises; and that many instances daily occur of horses both running and hunting, without undergoing any previous preparation by purging medicines; and it is likewise well known, that, even when purging medicines are given, still regular exercise is found to be absolutely necessary, in order to habituate the horse to this kind of active labour.

"Post horses likewise furnish a further proof of what has been advanced. It is well known how they can be brought to travel very long stages, and with great speed, without any preparation, farther than good feeding, and inuring them by degrees to this violent labour." Bracken, who understood this subject well, and who was likewise a great sportsman, took great pains, in hopes of exploding this absurdity. He has given it as his opinion, that in most cases, good feeding, regular exercise, &c. will make a horse fit to start for a plate, without the use of many purgative compositions to carry off grease, and mend his wind; for the jockeys, he says, are too fond of giving purges to horses, by which they certainly weaken their constitutions, by causing the fibres of the stomach and guts to become lax and flabby. To strengthen this assertion, he mentions the case of a mare of his own, that he had run for six years, having in that time given her only two purges; "neither," says he, "had she an ounce of any kind of medicine during that time, except every morning, and mostly every evening, a bout the bigness of a pigeon's egg of my cordial ball; and, I fancy, she performed as well as most of her neighbours, for she won eight plates out of nine, and four out of six, every year."

Mr. Clark next speaks of the vulgar opinion of humours falling down into this or that particular part of the body, if a horse be not properly purged, &c. before he undertakes any active exercises, such as racing, hunting, &c.

"It may be of use to the young practitioner," he says, "to explain what is meant by the phrase of humours falling down; but at the same time, I must inform him, that this phrase is so generally in use, that, when a horse's eyes are affected, the humours are said to fall down into them, although they are situated nearly in the most elevated part of the body. But to explain their falling down to the extremities, I shall take a case that frequently occurs. When a horse, that is in the highest state of health, but too fat and full of juices, &c. and accustomed to stand much at rest, is suddenly put to violent or long-continued exercises, his legs will be apt to swell soon after; they will perhaps continue in that state for some time; they may at last break out in running sores about the heels, and form cracks, &c.; when in this situation, it is said, that the humours have fallen down to the legs. Here a question naturally occurs, Where were these humours before the horse got this severe exercise, and how came they to fall down on this occasion only?"

Unless a horse has been gradually habituated to exercise previous to his undergoing that which is violent or long continued, his vessels will be too full of fluids, and these, especially the finer capillaries, from the force and rapidity of the circulation during the exercise, will admit the grosser fluids that do not usually circulate in them. They likewise are liable, in these cases, to be ruptured: hence the fluids they contain escape into the cellular membrane, where they stagnate, and, being then out of the course of circulation, occasion a swelling. "If this happens in the legs," says Mr. Clark, "as they are the most depending parts of the body, the humours are then said to have fallen down, the swelling causes a distension of the skin, &c.; the cuticular pores are then enlarged, and admit through them the thinner parts of the fluids to the outward surface of the skin, which, on being exposed to the external air, are then changed in their quality, and acquire, according to circum-



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stances; either a soapy, clammy, or greasy nature, or else a sharp fetid ichorous quality, that erodes the skin, and, by lodging there, form small ulcers.

"It ought always to be remembered, that great evacuations weaken an animal body, and, if they are repeated too frequently, and too close upon one another, without allowing a proper interval between each, or, if they are carried to excess, which is sometimes the case, the weakness in the animal system is thereby increased, the powers of life are quite overcome, and death follows, of course."

The author however would not be understood to mean, that purging medicines are never to be used on these occasions. On the contrary, he expresses himself fully sensible of their good effects, when judiciously administered, the horse being at the same time properly managed during their operation. "But," says he, "I do not approve of repeating purge after purge, merely because this or that horse is to run or hunt, without first considering whether the animal be fat or lean, or whether he has been kept at hard meat, with proper exercise, or whether he has run a considerable time, or late in the season, at grass; all these, and a number of other circumstances necessary to be attended to, ought to be duly weighed and maturely considered, before any purging medicines are administered: for example, if a horse has run long at grass, and is of a plethoric or full habit of body, evacuations by purging, and diuretic medicines to a certain degree, are necessary, together with length of time, good feeding, and regular exercise, to bring his body into that proper habit to enable him to perform with freedom such active exercises. But if a horse is of a lean, low, or dry habit of body, whether it may proceed from the want of proper food, from fatigue, or any other cause, are we to reduce him still lower by repeated evacuations of any kind? There is such an inconsistency in this practice, that it would not even deserve to be noticed, were it not too much practised every day; for, with some people, it is no matter of consideration with them what state of body a horse may be in, that is, whether he be of a fat, or full, or lean, dry habit of body; still he is said to be full of humours, and which must be purged off before he is fit for hunting or running, &c. Horses, in the latter situation, require only good feeding, and regular exercise, to strengthen and improve their constitutions, which cannot fail of taking place, if the viscera are sound, and the horse otherwise in a healthy state. And, even although a horse should be a little inclined to the full, or what is called the plethoric habit, yet, from the use of diuretic medicines, which are commonly given on these occasions, together with regular airings and proper exercise, good feeding, dressing, &c. he may be brought into that proper habit of body which will enable him to perform the most violent labour with the greatest ease to himself, and without any bad consequences."

After a variety of other arguments calculated to show, that repeated evacuations, of any kind, are not necessary for horses in training either for the turf or the field, Mr. Clark suggests, that if those horses that are intended for hunting were only allowed the spring-grass, and taken up about the middle or towards the latter end of June, before the grass becomes too rank, although it may be

rather inconvenient to have them in the house at that season, yet the owner would find his account in it. The allowance of oats, he observes, must be but small for some little time, but it might be increased, together with the horse's exercise, as the hunting season approaches. "Running horses might be treated in the same manner, according to the season in which they are to run, allowing both a greater length of time in the habitual practice of these exercises, together with proper feeding, dressing, &c. This treatment, together with the use of those alterative and diuretic medicines, which are usually given on these occasions, would render horses much stronger and fitter for these active exercises, without wearing out their constitutions by the repeated use of purging medicines."

Mr. Clark next adverts to the use of purging, as a remedy in diseases. "The substances," says he, "that are used for purging or emptying the alimentary canal, may be distinguished into two kinds, the lenient, which open the belly gently; and the drastic, which purge more briskly. The lenient ought always to be preferred when there appears any unusual commotion in the vascular system, which may easily be known by the quickness of the pulse, &c.; for, although purging medicines increase the motion of the pulse during their operation, yet they afterwards abate or lessen the motion of the blood, by drawing off a considerable quantity of the animal fluids by stool; they likewise clear the intestines of sharp stimulating matters or worms, which occasion an unusual degree of irritation in the system; they likewise may be given with different intentions, as circumstances may require, in small doses, to keep the body open, and prevent an accumulation of feces or dung in the intestines, which happens in diseases. In cases of frequent returns of the gripes or cholice, but not during the fit, lest the guts should then be inflamed, they should therefore be given in the intervals, in order to prevent the return of the complaint."

"But, in cases where it is thought necessary to clear the intestines thoroughly, in strong robust horses, the drastic purges may be given, provided there is no great commotion in the circulation of the blood at the time. Purging medicines are of great service in cases where the intestines appear to be loaded with viscid or thick slime, or when it appears, by long-continued costiveness, that the peristaltic motion of the intestines is in some degree suspended; in gross habits, especially where there is any tendency to swellings in the legs, attended with running sores, &c.; in dropsical swellings in any part of the body; in diseases of the head, rheums, or defluxions about the eyes; in rheumatic lameness, when the pains seem to move from one limb to another; in the jaundice; in obstinate coughs, especially when the horse is of a full habit of body; in most cutaneous diseases, or when a number of small pimples or lumps arise on the skin, and suddenly disappear again, or when the lumps discharge a sharp fluid of an ichorous quality; in plethoric or full habits, when the horse is intended for violent or active exercises, as running, hunting, &c.; in cases where it is judged necessary to lessen the general mass of fluids, or to divert them from flowing to any particular place in too great a quantity, as in inflammations of the lungs; in this last case, liquid purges are most proper, as they operate more expeditiously, in

very delicate constitutions, rhubarb should constitute the greatest part of their purging medicines; they are likewise most proper in cases of want of appetite: no doubt there may be other cases where purging medicines may be necessary; but these must depend on the discretion and judgment of the prescriber.

"On the other hand, it will be prudent to avoid giving purging medicines during extreme cold weather; likewise in all feverish complaints, when the pulse beats strong and quick, till such time as these symptoms are considerably abated; in all cases of extreme weakness, whether arising from fatigue or long-continued diseases; in all lean dry habits, unless there is reason to apprehend it proceeds from worms; in cases of very obstinate costiveness, till such time as that complaint is in some degree removed by clysters, soft feeding, &c.; in cases when a horse labours under any violent acute complaint; in diarrhoea or looseness. Aloetic purges, or those in which aloes enter into the composition, are to be avoided likewise in severe cholics or griping pains, although liquid purges, that are quicker in their operation, and less irritating, may be given with safety in the intervals, when it is observed that horses are subject to frequent attacks of this complaint.

"Previous to the giving of purging medicines to horses, especially to those that have been kept on hard meat, it will be prudent to keep them from all violent exercises for some days before the purge is given. If they are fat, and of a full habit, it will be necessary to draw some blood, to lower their feeding, and to give them that which is soft and relaxing, as boiled barley, mashies of bran, malt, &c. When horses are to be purged at grass, no preparation is necessary, farther than in plethoric or full habits, to treat them as above, observing, at the same time, that they be not costive, as this frequently happens although feeding on grass; in that case, they are to be taken into the stable, and treated as if they had been on hard feeding.

"In giving purging medicines to horses, it will always be most prudent to begin at first by giving mild lenient purges, in order to find out the strength of the constitution, &c. as very strong robust horses, to appearance, are sometimes easier purged than those of a more delicate make; and it frequently happens, that the same horse is easier purged at one time than at another, according to the state of the stomach and the intestines at the time the purge is given.

"Mild purges are therefore much safer at all times, and of more benefit to the constitution, than too strong ones; for the latter cause too great an irritation of the stomach and bowels; whence follow griping pains, great sickness, &c. and sometimes inflammation of the intestines; they likewise may occasion a superpurgation, by which the bowels are so much weakened, that they never afterwards recover their former tone; and hence follow loss of appetite, general weakness, and, perhaps, an habitual diarrhoea or looseness."

On the subject of mild purging, it may be proper here to advert to a practice very judiciously used by Mr. Professor Coleman, and recommended in his lectures. In the opinion of that gentleman there is no substance in the *materia medica* more appropriately used for purging horses than aloes, and its operation may be reduced to almost any degree of mildness by its administration in small and repeated doses: for instance one drachm con-

tinued at proper intervals, till its effects begin to take place, but not afterwards.

**PURGING FLAX.** See **LINUM CATHARTICUM**.

**PURGING NUT.** See **RICINUS MAJOR**, and **JATROPHA**.

**PURIFICATION.** *s.* (*putrificatio*, Lat.)

1. The act of making pure (*Boyle*). 2. The act of cleansing from guilt or pollution (*Taylor*).

**PURIFICATION**, in matters of religion, denotes an offering made the priest by women rising out of child-bed, before they are re-admitted into the church.

By the law of Moses, a woman, after bringing forth a male child, was unclean forty days; after a female eighty days; during which time, she was not to touch any thing holy, nor to go near the temple, but was to continue within doors, separate from all company, and commerce of others.

This term expired, she was to present herself at the temple, and at the door of the tabernacle, to offer a lamb, as an holocaust, and a pigeon or turtle; which the priest taking, offered to God, and prayed for her, that she might be purified.

This ceremony, which consisted of two things, an holocaust, and a sacrifice of expiation, was called טוהר טהרה, *purificatio*, *pur-gatio*.

The holy Virgin, though, according to the fathers, exempt from the terms of the law, yet complied therewith, and, at the time prescribed, went to the temple, and accomplished the law; in commemoration whereof, the church yearly solemnizes the feast of the purification of the Virgin, on the second of February; called also the feast of Candlemas.

**PURIFICATIVE.** *PU'RIFICATORY.* *a.* (from *purify*.) Having power or tendency to make pure.

**PURIFIER.** *s.* (from *purify*.) Cleanser; refiner (*Malachi*).

To **PURIFY.** *v. a.* (*purifier*, French; *purifico*, Latin.) 1. To make pure. 2. To free from any extraneous admixture (*Dryden*). 3. To make clear (*Sidney*). 4. To free from guilt or corruption (*South*). 5. To free from pollution, as by lustration (*Job*). 6. To clear from barbarisms or improprieties (*Sprat*).

To **PURIFY.** *v. n.* To grow pure (*Burnet*).

**PURIST.** *s.* (*puriste*, French.) One superstitiously nice in the use of words.

**PURITANS** is a term anciently used for the Calvinists of Great Britain, from their professing to follow the pure word of God, in opposition to all traditions, human constitutions, and other authorities.

The separation, whence this distinguishing appellation took its rise, commenced on the following occasion. Upon the accession of queen Mary, it is well known that popery revived in this kingdom; the statutes of king Edward were repealed, and the penal laws against heretics were put in execution against the reformers. Many suffered at home; and others escaped the fury of persecution by seeking refuge in foreign countries. Some went into France and Flanders; some to Geneva



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and others into those parts of Germany and Switzerland, where the reformation had taken place, and where the magistrates received them with great humanity, and allowed them places for public worship. The exiles were most numerous at Francfort; and there that contest and division began, which gave rise to the Puritans, and to that separation from the church of England, which continues to this day. In the year 1554, some of the English fugitives settled in this city; and agreed to conduct their worship, without answering aloud after the minister, and without using the liturgy and surplice; to begin the public service with a general confession of sins, then to sing a psalm, after which the minister prayed for the divine assistance, and next proceeded to the sermon; after sermon, a general prayer for all estates, and particularly for England, at the end of which was subjoined the Lord's prayer, and a rehearsal of the articles of belief; then the people were to sing another psalm, and the minister to dismiss them with a blessing. Such was the order which they had unanimously adopted; and having chosen a minister and deacons, they invited their dispersed brethren to join with them. In the year 1556, Dr. Cox, afterwards bishop of Ely, came to settle at Francfort with several of his friends; who, interrupting the public service by answering aloud after the minister, and reading the whole litany, in violation of the agreement upon which the congregation was formed, overpowered the first settlers; and obtaining leave of the magistrates for the free use of king Edward's service book, performed divine worship according to the rites that had been authorised by that prince; while others, who preferred the Genevan method of worship, as more pure and simple, left the city of Francfort, and removed to Basil and Geneva. Thus commenced the distinction of Puritans and Conformists, by which the two parties were afterwards known. The former were called Conformists, on account of their compliance with the ecclesiastical laws enacted by Edward VI. and the denominations of Nonconformists and Puritans were given to the latter, from their insisting upon a form of worship, more exempt from superstition, and of a purer kind than the liturgy of Edward seemed to them to be. Upon the accession of queen Elizabeth, the exiles returned to England, where each party strove to advance the reformation according to their own standard. The queen, with those who had weathered the storm at home, were only for restoring king Edward's liturgy; but the majority of the exiles were for the worship and discipline of the foreign churches, and refused to comply with the old establishment, declaiming loudly against the popish habits and ceremonies. However, the queen's party prevailed; and in 1559 a committee of divines was appointed to review king Edward's liturgy, who were instructed to strike out all offensive passages against the pope, and to make people easy about the belief of the corporal presence of Christ in the sacrament. But no alterations were made in favour of those who now began to be called Puritans, from their attempting a purer form of worship and discipline than had yet been established; and whose sentiments in many points were agreeable to those maintained by John Wickliffe, the first reformer. For they agreed with him in opinion, that in the sacrament of orders there ought to be but two degrees, presbyters or bishops, and deacons; that all human traditions are superfluous and sinful; that we

must practise and teach only the laws of Christ; that mystical and significant ceremonies in religious worship are unlawful; and that to restrain men to a prescribed form of prayer is contrary to the liberty granted them by God. The old festivals, with their eves and the popish habits, were continued as they were in the second year of king Edward VI. In 1558 the act of supremacy was passed, in which there is a remarkable clause, that gave rise to the court of high commission, which proved afterwards so oppressive; and in 1559 was passed an act for the uniformity of common prayer, and service in the church, and administration of the sacraments. The Puritans remonstrated against these proceedings, and complained, that the gross superstitions of popery, which they had looked upon as abrogated and abolished, were now revived, and even imposed by authority. Some required nothing less than that the church of England should be exactly modelled after that of Geneva; others only desired liberty of conscience, with the privilege of celebrating divine worship in their own way; but neither party obtained the object of their wishes. The queen, intent upon the suppression of this troublesome sect (as she was used to call it), permitted its enemies to employ for that purpose all the resources of artifice, and all the severity of the laws. The court reformers pleaded, that every prince had authority to correct all abuses of doctrine and worship within his own territories; the Puritans, on the other hand, whilst they disowned all foreign authority and jurisdiction over the church, could not admit of that extensive power which the crown claimed by the supremacy; apprehending it unreasonable, that the religion of a whole nation should be at the disposal of a single lay person. However, they took the oath, with the queen's explication in her injunctions, as restoring her majesty only to the ancient and natural rights of sovereign princes, over their subjects.

Farther, the court reformers allowed, that the church of Rome was a true church, though corrupt in some points of doctrine and government; that all her ministrations were valid, and that the pope was a true bishop of Rome, though not of the universal church. But the Puritans affirmed the pope to be antichrist, the church of Rome to be no true church, and all her ministrations to be superstitious and idolatrous; they renounced her communion, and durst not suspend the validity of their ordinations upon an uninterrupted line of succession from the apostles through her hands. Moreover it was agreed by all, that the holy scriptures were a perfect rule of faith; but the bishops and court reformers did not allow them to be the standard of discipline or church government; affirming that our Saviour and his apostles left it to the discretion of the civil magistrate, in those places where Christianity should obtain, to accommodate the government of the church to the policy of the state. But the Puritans apprehended the holy scriptures to be a standard of church discipline as well as of doctrine; at least that nothing should be imposed as necessary but what was expressly contained in, or derived from them by necessary consequence; and, besides, they maintained that the discretionary power was not lodged with the civil magistrate, but with the spiritual officers of the church. Farther, the court reformers maintained, that the practice of the primitive church for the first four or five centuries was a proper standard of church govern-

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ment and discipline, and in some respects a better than that of the apostles, which (according to them) was only accommodated to the infant state of the church while it was under persecution, whereas theirs was suited to the grandeur of a national establishment. Whereas the Puritans were for adhering to the Bible in the main principles of church government, and for admitting no church officers or ordinances, but such as are herein mentioned; and they apprehended, that the apostles, in establishing the first Christian church on the aristocratical plan then observed in the Jewish sanhedrim, designed it as an unchangeable model to be followed in all times and places. The court reformers also maintained, that things indifferent in their own nature, which are neither forbidden nor commanded in the holy scriptures, such as rites, ceremonies, habits, &c. might be settled, determined, and made necessary by the command of the civil magistrate, and that in such cases it was the indispensable duty of all subjects to observe them. But the Puritans insisted, that those things which Christ had left indifferent ought not to be made necessary by any human laws, and that such rites and ceremonies as had been abused to idolatry, and had a manifest tendency to lead men back to popery and superstition, were no longer indifferent, but to be rejected as unlawful. Nevertheless, both parties agreed too well in asserting the necessity of an uniformity of public worship, and of calling in the sword of the magistrate for the support and defence of their several principles; which they made an ill use of in their turns, as they could grasp the power into their hands. The standard of uniformity, according to the bishops, was the queen's supremacy, and the law of the land; according to the Puritans, the decrees of provincial and national synods, allowed and enforced by the civil magistrate; but neither party were for admitting that liberty of conscience, and freedom of profession, which is every man's right, as far as is consistent with the peace of the government under which he lives.

In the year 1564, upon a report that the habits, enjoined on the clergy, were generally neglected, and also of inattention to other imposed forms, the queen directed the ecclesiastical commissioners to consult some proper methods to reduce them to an exact uniformity; upon which they agreed on certain advertisements (as they were called) partly for due order in preaching and administering the sacraments, and partly for the apparel of ecclesiastical persons. To these advertisements certain protestations were annexed, to be made, promised, and subscribed by such as should hereafter be admitted to any office or cure in the church. The queen, though she would give no authority to the advertisements, which had occasioned much remonstrance and complaint, issued out a proclamation in 1565, peremptorily requiring uniformity in the habits, upon pain of prohibition from preaching, and deprivation. Parker, the archbishop of Canterbury, was violent and unrelenting; and by various methods of severity harassed, silenced, and deprived many of those who scrupled the use of the habits. The suspended ministers, finding that renewed applications to the queen and her commissioners were ineffectual, published in 1566 a small treatise in vindication of their conduct; in which they allege, that neither the prophets of the Old Testament, nor the apostles in the New, were distinguished by their garments; that a distinction of garments in the Chris-

tian church did not generally obtain till long after the rising of antichrist; that the garments against which they objected had been abused to idolatry, sorcery, and all kinds of conjurations; that they were an offence to weak Christians, an encouragement to ignorant and obstinate papists, and the use of them an affectation of returning to their communion; that at best they were only human appointments, subject to the apostle's reproof; Col. ii. 20—22. that allowing them to be indifferent (which they did not grant) yet they ought not to be imposed, because it was an infringement of the liberty with which Christ had made them free; and finally they urged the suffrage of foreign divines, who all condemned the habits, though they were not willing to hazard the reformation in its infancy, on account of them.

If, at this time, the habits and a few ceremonies had been left indifferent, both ministers and people would have acquiesced; but it was the compelling of these things by law that made them separate from the established church. Accordingly, in 1566, they came to a resolution, alleging it to be their duty, in their present circumstances, to break off from the public churches, and to assemble, as they had opportunity, in private houses, or elsewhere, to worship God in a manner that might not offend against the light of their consciences; and it was debated among them, whether they should use as much of the common prayer and service of the church as was not offensive, or resolve at once, since they were cut off from the church of England, to set up the purest and best form of worship, most consonant to the holy scriptures, and to the practice of the foreign reformers. The latter of these measures was concluded upon; and accordingly they laid aside the English liturgy, and made use of the Geneva service book. However, it is necessary to observe, that though all the Puritans of these times would have remained in the church, if they might have been indulged in the habits and a few ceremonies, yet they were far from being satisfied with the hierarchy. They had other objections besides those for which they were deprived; of which we shall here subjoin a summary. They complained of the bishops affecting to be thought a superior order to presbyters, and claiming the sole right of ordination, and the use of the keys; and assuming, in connection with their office, temporal dignities, titles, and employments. As long, however, as the English bishops pretended to derive their dignity and authority from no other source than the laws of their country, and pleaded a right, merely human, to the rank they held in church and state, the controversy was carried on without excessive animosity and zeal; but the flame broke out with redoubled fury in the year 1588, when Bancroft, afterwards archbishop of Canterbury, ventured to assert that the order of bishops was superior to the body of presbyters, not in consequence of any human institution, but *jure divino*, or by the express appointment of God himself. Farther, the Puritans excepted against the titles and offices of archdeacons, deans, chapters, and other officials, belonging to cathedrals, as having no foundation in scripture, or primitive antiquity, and intrenching upon the privileges of the presbyters in the several dioceses. They complained of the exorbitant power and jurisdiction of the bishops and their chancellors in their spiritual courts, as derived from the canon law of the pope, and not from the word of God, or the statute law of the land. They lamented



## PURITANS.

the want of a godly discipline, and were uneasy at the promiscuous and general access of all persons to the Lord's table. Though they did not dispute the lawfulness of set forms of prayer, provided a due liberty was allowed for prayers of their own composure before and after sermon, yet they disliked the frequent repetition of the Lord's prayer in the liturgy, the interruption of the prayers by the frequent responses of the people, some passages in the office of marriage, as With my body I thee worship, and in that of burial, as In sure and certain hope of the resurrection to eternal life, pronounced over the worst of men, if not excommunicated, &c. They also objected against the reading of the apocryphal books in the church, while some parts of canonical scripture were omitted; and though they did not dislike the homilies, they thought that no man should be ordained a minister in the church, who was not capable of preaching and expounding the holy scriptures. They disapproved of several of the church festivals or holidays, as having no foundation in scripture, or primitive antiquity; and they disallowed of the cathedral mode of worship; nor did they approve of musical instruments in the church service. Finally, they scrupled conformity to certain rites and ceremonies, which were enjoined by the rubric, or the queen's injunctions; as the sign of the cross in baptism, baptism by midwives or other women, in cases of sickness, and the mode of churching women; the use of god fathers and god-mothers, to the exclusion of parents from being sureties for the education of their own children; the custom of confirming children, as soon as they could repeat the Lord's prayer and their catechism, by which they had a right to come to the sacrament, without any other qualification, and the imposition of hands, as a sign of the divine favour, which seemed to them to imply a sacramental efficacy in this ceremony; kneeling at the sacrament of the Lord's supper, whilst they considered that Christ gave it to his disciples rather in a posture of feasting than of adoration; that it had no foundation in antiquity; that it had been grossly abused by the papists to idolatry in their adoration of the host, and that, if the posture were indifferent, it ought not to be imposed as a necessary term of communion; nor did they approve of administering either of the sacraments in private, even in cases of danger; bowing at the name of Jesus; giving the ring in marriage, which they considered as derived from the papists, who make marriage a sacrament, and the ring a sort of sacred sign or symbol; the prohibition of marriage during certain times of the year, and the licensing it for money; and, lastly, the wearing of the surplice, and other vestments to be used in divine service.

In points of doctrine there was, at this time, no difference between the Puritans and Conformists; and if we add one article more to the preceding, we shall have the principal heads of controversy between the church of England and the Protestant dissenters at this day; viz. the natural right which every man has to judge for himself, and make profession of that religion he apprehends most agreeable to truth, as far as it does not affect the peace and safety of the government under which he lives; without being determined by the prejudices of education, the laws of the civil magistrate, or the decrees of councils, churches, or synods.

Towards the latter end of queen Elizabeth's reign, there arose a party, which were first for softening, and then for overthrowing, the received opinions concerning predestination, perseverance, free-will, effectual grace, and the extent of Christ's redemption. The clergy of the episcopal church began to lean towards the notions concerning these intricate points, which Arminius propagated some time after this; while, on the other hand, the Puritans adhered rigorously to the system of Calvin. Several episcopal doctors remained attached to the same system in the reign of James I., &c. and all these abettors of Calvinism, whether episcopal or presbyterian, were called doctrinal Puritans. At length, according to Mr. Fuller (Church Hist. book ix. p. 97. book x. p. 100) the name was extended to stigmatise all those who endeavoured in their devotions to accompany the minister with a pure heart, and who were remarkably holy in their conversation; so that a Puritan was a man of severe morals, a Calvinist in doctrine, and a non-conformist to the ceremonies and discipline of the church, though he did not totally separate from it.

Queen Elizabeth was violent in her opposition to the Puritans through the whole course of her reign; and besides the ordinary courts of the bishops, she erected, as we have already observed, a new tribunal, called the court of high commission, which suspended and deprived men of their livings, not by the verdict of twelve men upon oath, but by the solemn determination of three commissioners of her own nomination, founded not upon the statute law of the realm, but upon the canon law; and instead of producing witnesses in open court to prove the charge, they assumed a power of administering an oath *ex officio*, whereby the prisoner was obliged to answer all questions the court should put to him, though never so prejudicial to his own defence. If he refused to swear, he was imprisoned for contempt; and if he took the oath, he was convicted upon his own confession.

During the reign of James I. from whom the Puritans expected more indulgent treatment, they were treated with great severity, and many of them obliged to leave the kingdom, and retire to Holland; and from thence considerable numbers migrated to America, in the year 1620. All were Puritans, in the estimation of king James, who adhered to the laws of the land in opposition to his arbitrary government, though otherwise ever so good churchmen. These were called Puritans in the state; and those who scrupled the ceremonies, and adhered to the doctrines of Calvin, were church Puritans, who, though comparatively few, yet being joined by those of the other class, became the majority of the nation. The success that attended the first emigrators, who settled in that part of America afterwards called New Plymouth, engaged great numbers of Puritans, who groaned under the oppression of the bishops, and the severity of a court, by which this oppression was authorised, to follow the fortunes of these religious adventurers; and this produced a second emigration in the year 1629, which gave birth to the second grand colony, commonly known by the name of the Massachusetts Bay. The colony of Connecticut was formed by emigrants of the same class in 1636, and that of New Haven in 1637, who fled from the persecution of Laud, and the oppressions of the star-chamber and high-commission courts. Afterwards, when the Puri-

tans were not allowed to transport themselves to New England, many of them removed, with their families, into the Low Countries.

After the restoration of Charles II. in the year 1662, the name of Puritans, says bishop Burnet, was changed into that of Protestant Non-conformists, who were subdivided into Presbyterians, Independents, Baptists, and Quakers. At this time a public law, called the Act of Uniformity, was enacted, by which all who refused to observe the rites, and subscribe the doctrines, of the church of England, were entirely excluded from its communion. From this period until the reign of king William III. the Non-conformists were in a precarious and changing situation, sometimes involved in calamity and trouble, and at other times enjoying some intervals of tranquillity and certain gleams of hope, according to the varying spirit of the court and ministry, but never entirely free from perplexities and fears. But in the year 1689 their affairs took a favourable turn, when a bill for the toleration of all Protestant Dissenters from the church of England, except the Seceders, passed in parliament almost without opposition, and delivered them from the penal laws to which they had been subjected by the act of uniformity, and other acts passed under the house of Stuart.

For the other acts, see NON-CONFORMISTS, TOLERATION, &c.: from which it will appear, that every separate congregation which is held in a place duly licenced, and where a minister who has legally qualified officiates, is as completely established by the laws of England, as the Episcopalian church itself.

**PURITANICAL.** *a.* (from *puritan.*) Relating to puritans (*Walton*).

**PURITANISM.** *s.* (from *puritan.*) The notions of a puritan (*Wotton*).

**PURITY.** *s.* (*purité*, Fr. *puritas*, Lat.) 1. Cleanness; freedom from foulness or dirt (*Thomson*). 2. Freedom from guilt; innocence (*Wake*). 3. Chastity; freedom from contamination of sexes (*Shakspeare*).

**PURL.** *s.* (contracted from *purgle*.) 1. An embroidered and puckered border (*Bacon*). 2. A kind of medicated malt liquor, in which wormwood and aromatics are infused.

**To PURL.** *v. n.* To murmur; to flow with a gentle noise (*Milton*).

**To PURL.** *v. a.* To decorate with fringe or embroidery (*Ben Jonson*).

**PURLIEU.** *s.* The grounds on the borders of a forest; border; enclosure; district (*Speculator*).

**PURLINS.** *s.* In architecture, those pieces of timber that lie across the rafters on the inside to keep them from sinking in the middle of their length (*Bailey*).

**To PURLOIN.** *v. a.* (*pour* and *loin*, Fr.) To steal; to take by theft (*Denham*).

**PURLOINER.** *s.* (from *purloin.*) A thief; one that steals clandestinely (*L'Estrange*).

**PURNEAH,** a town of Hindustan, in Bengal, on a river that flows into the Ganges, 125 miles N.N.W. of Moorshedabad. Lon. 87. 40 E. Lat. 25. 47 N.

**PURPARTY.** *s.* (*pour* and *parti*, French.) Share; part in division (*Davies*).

**PURPLE.** *a.* (*poupre*, Fr. *purpureus*, Lat.)

1. Red tinged with blue (*Wotton*). 2. In poetry, red (*Dryden*).

**To PURPLE.** *v. a.* (*purpuro*, Lat.) To make red; to colour with purple (*Milton*).

**PURPLE.** *s.* The purple colour; a purple dress (*Milton*).

**PURPLE APPLE,** in botany. See ANNONA.

**PURPLE FISH,** in helminthology. See MUREX.

**PURPLES.** *s.* (without a singular.) Spots of livid red, which break out in malignant fevers; a purple fever.

**PURPLISH.** *a.* (from *purple*.) Somewhat purple (*Boyle*).

**PURPORT.** *s.* (*pourporte*, Fr.) Design; tendency of a writing or discourse (*Norris*).

**To PURPORT.** *v. a.* (from the noun.) To intend; to tend to show (*Rowe*).

**PURPOSE.** *s.* (*propos*, Fr. *propositum*, Lat.) 1. Intention; design (*Knolles*). 2. Effect; consequence (*Baker*). 3. Instance; example (*L'Estrange*).

**To PURPOSE.** *v. a.* (from the noun.) To intend; to design; to resolve (*Hooker*).

**PURPOSELY.** *ad.* (from *purpose*.) By design; by intention (*Pope*).

**PURPRISE.** *s.* (*pourpris*, old Fr. *purprism*, law Lat.) A close or enclosure; as also the whole compass of a manor (*Bacon*).

**PURPURE,** in heraldry. The colour so called, which signifies purple, is in engraving represented by diagonal lines, from the left to the right. See HERALDRY.

**PURPUREUS.** See CONVULVULUS.

**To PURR.** *v. n.* To murmur as a cat or leopard in pleasure.

**PURRE,** in ornithology. See CHARADRIUS and TRINGA.

**PURSE.** *s.* (*bourse*, Fr. *pwrs*, Welsh.) A small bag in which money is contained (*Shakspeare*).

**To PURSE.** *v. a.* (from the noun.) 1. To put into a purse (*Dryden*). 2. To contract as a purse (*Shakspeare*).

**PURSENET.** *s.* (*purse* and *net*.) A net of which the mouth is drawn together by a string.

**PURSEPROUD.** *a.* (*purse* and *proud*.) Puffed up with money.

**PURSER,** an officer aboard a man of war, appointed by the lords of the admiralty, who receives her victuals from the victualler; and is to take care, that it be in good condition, and well laid up, and stowed. He is also to see that they are carefully distributed to the officers and crew, according to the instructions which he has received from the commissioners of the navy for that purpose. To him also belongs the distribution of the slops, &c.

He is also to keep a list of the men and boys belonging to the ship, and to set down, exactly, the day of each man's admittance into pay; that the paymaster or treasurer of the navy may issue out his disbursements, and pay off the men according to the muster-book.

**PURSINESS.** **PURSVENESS.** *s.* (from *pursey*.) Shortness of breath.



**PURSIVENESS**, among farriers, a disorder common to horses, accompanied with difficulty of respiration beyond that of a common cold or cough, but short of broken-wind. It generally proceeds from a cold neglected or treated improperly, and hereby rendered chronic; and is to be attacked by the remedies best employed in obstinate colds, such as bleedings, detergents, attenuants, mercurial purges, &c.

**PURSLANE**, in botany. See **PORTULACA**.

**PURSLANE** (Sea). See **ATRIPLEX**.

**PURSLANE-TREE**. See **PORTULACARIA**.

**PURSU'ABLE**. *a.* (from *pursue*.) What may be pursued.

**PURSU'ANCE**. *s.* (from *pursue*.) Prosecution; process.

**PURSU'ANT**. *a.* (from *pursue*.) Done in consequence or prosecution of any thing.

*To PURSU'E. v. a.* (*poursuivre*, Fr.) 1. To chase; to follow in hostility (*Shakspeare*). 2. To prosecute; to continue (*Proverbs*). 3. To imitate; to follow as an example (*Dryden*). 4. To endeavour to attain (*Prior*).

*To PURSU'E. v. n.* To go on; to proceed. A gallicism (*Boyle*).

**PURSU'ER**. *s.* (from *pursue*.) One who follows in hostility (*Denham*).

**PURSU'IT**. *s.* (*poursuite*, Fr.) 1. The act of following with hostile intention (*Milton*). 2. Endeavour to attain (*Dryden*). 3. Prosecution (*Clarendon*).

**PURSUIVANT**. *s.* (*poursuivant*, Fr.) A state messenger; an attendant on the heralds (*Dryden*).

**PURSY**. *a.* (*poussif*, Fr.) Shortbreathed and fat (*Shakspeare*).

**PUR'TENANCE**. *s.* (*appertenance*, Fr.) The pluck of an animal (*Exodus*).

*To PURVEY. v. a.* (*pourvoir*, Fr.) 1. To provide with conveniences (*Spenser*). 2. To procure (*Thomson*).

*To PURVEY. v. n.* To buy in provisions (*Milton*).

**PURVEYANCE**. *s.* (from *purvey*.) 1. Provision (*Spenser*). 2. Procurement of victuals. 3. An exaction of provisions for the king's followers (*Bacon*).

**PURVEYOR**. *v.* (from *purvey*.) 1. One that provides victuals (*Raleigh*). 2. A procurer; a pimp (*Addison*).

**PURVIEW**. *s.* (from *pourvoir*, Fr.) Proviso; providing clause (*Hale*).

**PURULENCE**. **PURULENCY**. *s.* (from *purulent*.) Generation of pus or matter (*Arbuthnot*).

**PURULENT**. *a.* (*purulent*, Fr. *purulentus*, Lat.) Consisting of pus or the running of wounds (*Arbuthnot*).

**PURYSBURG**, a town of S. Carolina, in Beaufort district, built by a colony of Swiss, with a view to the culture of silk. It is seated on the river Savanna, 20 miles N.N.W. of the town of Savanna. Lon. 81.5 W. Lat. 32. 12 N.

**PUS**. A whitish, bland, cream-like fluid, heavier than water, found in phlegmonous abscesses, or on the surface of sores. It is dis-

tinguished, according to its nature, into laudable or good pus, serophulous, serous, and ichorous pus, &c.

The most generally established opinion of the nature of pus, till within the last thirty years, has been, that it was composed both of solids and fluids; nor is the opinion even now entirely exploded. It was called true, or laudable pus, to distinguish it from a similar discharge, supposed to be composed wholly of fluids, called mucus. Yet the distinctions between pus and mucus have been very ill defined: there was thought to be a difference in their appearance to the eye; but the principal mark of distinction arose from a breach of surface being believed necessary to the formation of pus, but not of mucus; consequently, when there was no breach in the solids, the discharge was considered to be only mucus.

This notion of pus must have taken its rise from an idea that the solids of the parts were broken down into pus.

The physiologists who formed this theory cannot, however, be said to have made their distinctions with great accuracy, since the discharge, in consequence of a blister being applied to the surface of the body, was admitted to be pus; although in such cases there is no loss of substance, and therefore the discharge should have been called mucus.

To ascertain a real difference between the fluid formed where there is a breach in the solids, and that met with where the surface is entire, has been considered an object meriting the attention of some of our most eminent surgeons, although the fluid formed under both these circumstances will be found to be precisely the same. This inquiry must have arisen from their adhering to the hypothesis which has been mentioned, and which not being founded upon the principles of the animal economy, can never explain, satisfactorily, any of the operations in the living body.

It will be found, upon investigation, that the appearance of a discharge produced from the secreting surface of an internal canal, or excretory duct, when the produce of the suppurative inflammation, is exactly similar to a discharge, in consequence of inflammation in any other part of the body. The only respect in which they differ is, that, in the one case, there is no breach of surface, and in the other, there most commonly appears to be one. The one is suppuration alone, the other suppuration attended by ulceration.

Mr. Home has been at considerable pains to collect those properties and circumstances which have been ascertained respecting pus; and has endeavoured, by investigating others not so well understood, to render the history of these observations, which are extracted from his work, pus will be considered as a fluid, whose formation depends upon a process in the animal economy analogous to glandular secretions. Its production, Mr. Home observes, depends upon inflammation having previously taken place in some part of the

body, either in the common reticular membrane, upon the internal surface of circumscribed cavities, or the surfaces of internal canals, which form excretory ducts of the body.

Inflammation is necessary for the formation of pus; and although a fluid, somewhat similar, is produced without any preceding inflammation, such fluids, not having all the properties of true pus, can be readily distinguished from it.

Pus, whether it is formed in the cellular membrane upon an investing membrane, or on the internal surface of an excretory duct, has exactly the same appearance and general properties. No distinctions will, therefore, be made between pus produced under this or that peculiar circumstance; believing it, when preceded by the same degree of inflammation in a healthy constitution, and when free from any extraneous substances, to be the same fluid. But as a difference in pus may arise from a variety of causes, it will be proper first to mark those properties which really belong to it in a healthy state of body, and afterwards mention the variations to which it is liable.

Pus taken from an healthy ulcer, near the source of circulation, as on the arm or breast, readily separates from the surface of the sore, the granulations underneath being small, pointed, and of a florid red colour, and has the following properties: it is nearly of the consistence of cream; is of a white colour; has a mawkish taste; and when cold, is inodorous; but when warm, has a peculiar smell. Examined in a microscope, it is found to consist of two parts, of globules, and a transparent colourless fluid; the globules are probably white, at least they appear to have some degree of opacity. Its specific gravity is greater than that of water. It does not readily go into putrefaction. Exposed to heat, it evaporates to dryness; but does not coagulate. It does not unite with water in the heat of the atmosphere, but falls to the bottom; yet, if kept in a considerable degree of heat, rises and diffuses through the water, and remains mixed with it, even after having been allowed to cool, the globules being decomposed.

Pus varies in its appearance, according to the different circumstances which affect the ulcer that forms it; such as, the degree of violence of the inflammation, also its nature, whether healthy or unhealthy; and these depend upon the state of health, and strength of the parts yielding pus. These changes arise more from indolence and irritability, than from any absolute disease; many specific diseases, in healthy constitutions, producing no change in the appearance of the matter from their specific quality. Thus, the matter from a gonorrhœa, from the small-pox pustules, the chicken-pox, and from an healthy ulcer, has the same appearance, and seems to be made up of similar parts, consisting of globules floating in a transparent fluid, like common pus; the specific properties of each of these poisons

being superadded to those of pus. Matter from a cancer may be considered as an exception; but a cancerous ulcer is never in a healthy state.

In indolent ulcers, whether the indolence arise from the nature of the parts, or the nature of the inflammation, the pus is made up of globules and flaky particles, floating in a transparent fluid; and globules and flakes are in different proportions, according to the degree of indolence: this is particularly observable in serophulous abscesses, preceded by a small degree of inflammation. That this flaky appearance is no part of true pus, is well illustrated by observing, that the proportion it bears to the globules is greatest where there is the least inflammation; and in those abscesses that sometimes occur, which have not been preceded by any inflammation at all, the contents are wholly made up of a curdy or flaky substance, of different degrees of consistence, which is not considered to be pus, from its not having the properties stated in the definition of that fluid.

The constitution and part must be in health to form good pus; for very slight changes in the general health are capable of producing an alteration in it, and even of preventing its being formed at all, and substituting in its place coagulating lymph.

This happens most readily in ulcers in the lower extremities, owing to the distance of the parts from the source of the circulation, rendering them weaker. And it is curious to observe the influence that distance alone has upon the appearance of pus.

A man had a compound fracture of the right leg, and an ulcer on the ankle of the left. He was in tolerable health, the ulcer looking well. An attack of fever came on soon after, when the ulcer on the ankle ceased to form good pus, the matter not separating readily from its surface, while the compound fracture continued to look very well; but in twelve hours more the same change had taken place in the opening of the compound fracture, which was about six inches higher up the leg than the ulcer. In irritable ulcers, the discharge is often thin, being principally made up of an aqueous fluid, possessed of an irritating quality, and containing few globules; such ulcers are commonly attended with hemorrhage from the smaller vessels, by which the discharge is very materially altered in its properties, is rendered acrid, and more ready to run into putrefaction than true pus. We find, however, in many irritable constitutions, the same appearances that were mentioned to take place in the indolent, the coagulating lymph being thrown out, and adhering firmly to the surface of the ulcer; therefore the appearance of an ulcer alone will not lead us to a correct judgment of its nature, but will only inform us whether it be healthy or unhealthy.

Although these different appearances of pus have been noticed, from their being so connected with its history as to deserve attention, they are not to be considered as belonging to



true pus, but as arising from a defect in the process, whatever it is, by which pus is formed.

Pus differs from chyle in its globules being larger, not coagulating by exposure to the air, nor by heat, which those of chyle do.

The pancreatic juice contains globules; but they are much smaller than those of pus.

Milk is composed of globules, nearly of the same size as those of pus, but much more numerous. Milk coagulates by rennet, which pus does not; and contains oil and sugar, which are not to be discovered in pus.

The cases in which pus is formed are, properly speaking, all reducible to one, which is, the state of parts consequent to inflammation. For, as far as we yet know, pus has in no instance been met with unless preceded by inflammation; and although, in some cases, a fluid has been formed independent of preceding inflammation, it differs from pus in many of its properties, as has been already observed.

In inflammation, the smaller blood-vessels become considerably enlarged; and what is curious, this takes place in the greatest degree in the veins; the small vessels are not only enlarged, but become more numerous; which does not proceed entirely from the blood being propelled further than usual in the old veins, but from new ones being formed; and this takes place in a much shorter time than has been imagined. It is highly probable, that these new vessels are so constructed, as to make the blood undergo certain changes, by which the fluid that afterwards constitutes pus is formed.

It has been long ascertained, that new vessels are generated in extravasated coagula of blood, and exudations of coagulating lymph. The following case ascertains the period in which this effect can be produced to be within twenty-four hours; and we know, that pus commonly requires a much longer time for its formation, under the same circumstances, and in similar parts.

Mr. Home performed the operation for the strangulated hernia upon a man in other respects in health, at seven o'clock in the morning. The hernial sac was laid open, and the gut, which proved to be a portion of the ilium about six inches in length, was attentively examined, previous to its being returned into the cavity of the belly. It had the natural polished surface peculiar to an intestine; and although its vessels were turgid with blood, it did not appear that they were uncommonly numerous. After the operation, the symptoms did not abate so much as might have been expected; and during the afternoon he complained of pain in the lower part of his belly. He had no passage by stool; and next morning, about seven o'clock, his pulse was scarcely perceptible to the touch; his skin cold and clammy; and about twelve o'clock at noon he died, having lived twenty-nine hours after the operation.

The body was opened, and the portion of gut which had been strangulated was found considerably inflamed, the external surface having lost its natural polish, and having seve-

ral small portions of exudated coagulating lymph adhering to it. The vessels of the gut were minutely injected, the arteries with a red-coloured injection, and the veins with a yellow one. Upon examination afterwards, all these adhering portions of coagulating lymph were found to be injected, having a considerable artery going to each of them, and a returning vein, which was larger than the artery. It is evident, therefore, that the coagulating lymph was laid upon the external surface of the gut after the operation; and we cannot suppose, that any such process as the forming new vessels could have been going on during the last five hours of his life, when the pulse in the wrist was scarcely to be felt, and the powers of life were so much weakened in every respect. We must therefore conclude, that the whole operation of throwing out coagulating lymph, and supplying it with blood-vessels after it had become solid, was effected in less than twenty-four hours.

This shows, that inflammation forms a vascular surface previous to the secretion of pus. Is it not, therefore, highly probable, that the newly formed parts are so organized as to secrete that fluid?

In considering the time required for the formation of pus, it is necessary to take notice of the periods which are found, under different circumstances, to intervene between a healthy or natural state of the parts, and the presence of that fluid after the application of some irritating substance to the skin.

In cases of wounds made into muscular parts, where blood vessels are divided, the first process which takes place is the extravasation of red blood; the second is the exudation of coagulating lymph, which afterwards becomes vascular; and the third, the formation of matter, which last does not, in common, take place in less than two days; the precise time will, however, vary exceedingly, according to the nature of the constitution, and the state of the parts at the time.

If an irritating substance be applied to a cuticular surface, upon which it raises a blister, pus will be formed in about twenty-four hours.

It is sometimes of very great consequence, and especially in cases of doubtful phthisis, to distinguish pus from mucus; and hence the means of distinguishing these two fluids was lately proposed as the subject of a prize disputation by the Æsculapian society of Edinburgh. The prize was gained by Mr. Charles Darwin, student of medicine from Lichfield.

The conclusions drawn from his experiments were, 1. Pus and mucus are both soluble in the vitriolic acid, though in very different proportions, pus being by far least soluble. 2. The addition of water to either of these compounds decomposes it. The mucus thus separated either swims in the mixture, or forms large flocculi in it; whereas the pus falls to the bottom, and forms, on agitation, an uniform turbid mixture. 3. Pus is diffusible through a diluted vitriolic acid, though mucus

is not. The same also occurs with water, or with a solution of sea-salt. 4. Nitrous acid dissolves both pus and mucus. Water added to the solution of pus produces a precipitate, and the fluid above becomes clear and green, while water and the solution of mucus form a turbid dirty-coloured fluid. 5. Alkaline lixivium dissolves, though sometimes with difficulty, mucus, and generally pus. 6. Water precipitates pus from such a mixture, but does not mucus. 7. Where alkaline lixivium does not dissolve pus, it still distinguishes it from mucus, as it then prevents its diffusion through water. 8. Coagulable lymph is neither soluble in concentrated nor diluted vitriolic acid. 9. Water produces no change on a solution of serum in alkaline lixivium, until after long standing, and then only a very slight sediment appears. 10. Corrosive sublimate coagulates mucus, but does not pus.

From the above experiments, it appears that strong sulphuric acid and water, diluted sulphuric acid, and caustic alkaline lixivium and water, will serve to distinguish pus from mucus; that the vitriolic acid can separate it from coagulable lymph, and alkaline lixivium from serum. Hence, when a person has any expectorated matter, the decomposition of which he wishes to ascertain, let him dissolve it in vitriolic acid, and in caustic alkaline lixivium; and let him add pure water to both solutions. If there is a fair precipitation in each, he may be assured that some pus is present. But if there is a precipitation in neither, it is a certain test that the mixture is entirely mucus. If the matter cannot be made to dissolve in alkaline lixivium by time and trituration, we have also reason to believe that it is pus.

**TO PUSH. v. a. (pousser, Fr.)** 1. To strike with a thrust (*Exodus*). 2. To force or drive by impulse (*Job*). 3. To force not by a quick blow, but by continued violence (*Shakspeare*). 4. To press forward: as, to push a prosecution (*Addison*). 5. To urge; to drive (*Addison*). 6. To enforce; to drive to a conclusion (*Swift*). 7. To importune; to tease.

**TO PUSH. v. n.** 1. To make a thrust (*Addison*). 2. To make an effort (*Dryden*). 3. To make an attack (*Daniel*). 4. To burst out with violence.

**PUSH. s. (from the verb.)** 1. Thrust; the act of striking with a pointed instrument (*Knolles*). 2. An impulse; force impressed (*Addison*). 3. Assault; attack (*Watts*). 4. A forcible onset; a strong effort (*Shakspeare*). 5. Exigence; trial; extremity (*Atterbury*). 6. A sudden emergence (*Shakspeare*). 7. A pimple; an efflorescence; a wheal (*Bacon*).

**PUSHER. s. (from push.)** He who pushes forward.

**PUSHING. a. (from push.)** Enterprising; vigorous.

**PUSHPIN. s. (push and pin.)** A child's play, in which pins are pushed alternately (*L'Estrange*).

**PUSILLANIMITY. s. (pusillanimité, Fr.)** Cowardice; meanness of spirit (*South*).

**PUSILLA'NIMOUS. a. (pusillanime, Fr.)** Meanspirited; narrowminded; cowardly (*Ba.*).

**PUSILLA'NIMOUSNESS. s. (from pusillanimous.)** Meanness of spirit.

**PUSS. s.** 1. The fondling name of a cat (*L'Estrange*). 2. The sportsman's term for a hare (*Gay*).

**PUSTULA. (pustula, of pus, matter.)** See **PUSTULE**.

**PUSTULE.** An elevation of the cuticle, sometimes globate, sometimes conoidal in its form, and containing pus, or a lymph which is in general discoloured. Pustules are various in their size, but the diameter of the largest seldom exceeds two lines. There are many different kinds of pustules, properly distinguished in medical authors, by specific appellations, as 1. Phlyzaciū, a small pustule containing pus, and raised on a hard, circular, inflamed base, of a vivid red colour. It is succeeded by a thick, hard, dark-coloured scab. 2. Psudracriū, a minute pustule, irregularly circumscribed, producing but a slight elevation of the cuticle, and terminating in a laminated scab. Many of these pustules usually appear together, and become confluent. When mature they contain pus; and after breaking, discharge a thin watery humour.

**PŪSTULOUS. a. (from pustule.)** Full of pustules; simply.

**TO PUT. v. a. (putter, to plant, Danish.)**

1. To lay or reposit in any place (*Milton*). 2. To place in any situation (*L'Estrange*). 3. To place in any state or condition (*Shakspeare*). 4. To repose (*Chronicles*). 5. To trust; to give up. 6. To expose; to apply to any thing (*Locke*). 7. To push into action (*Swift*). 8. To apply (*Dryden*). 9. To use any action by which the place or state of any thing is changed (*Wake*). 10. To cause; to produce (*Locke*). 11. To compromise; to consign to writing. 12. To add (*Ecclus.*). 13. To place in a reckoning (*Locke*). 14. To reduce to any state (*Shakspeare*). 15. To oblige; to urge (*Boyle*). 16. To incite; to instigate; to exhort; to urge by influence (*Addison*). 17. To propose; to state (*Swift*). 18. To form; to regulate. 19. To reach to another (*Habakkuk*). 20. To bring into any state of mind or temper (*Locke*). 21. To offer; to advance (*Atterbury*). 22. To unite; to place as an ingredient (*Locke*). 23. **TO PUT by.** To turn off; to divert (*Taylor*). 24. **TO PUT by.** To thrust aside (*Sidney*). 25. **TO PUT down.** To baffle; to repress; to crush (*Shakspeare*). 26. **TO PUT down.** To degrade (*Spenser*). 27. **TO PUT down.** To bring into disuse (*Dryden*). 28. **TO PUT down.** To confute (*Shakspeare*). 29. **TO PUT forth.** To propose (*Judges*). 30. **TO PUT forth.** To extend (*Genesis*). 31. **TO PUT forth.** To emit, as a sprouting plant (*Bacon*). 32. **TO PUT forth.** To exert (*Taylor*). 33. **TO PUT in.** To interpose (*Collier*). 34. **TO PUT in.** To drive to harbour (*Chapman*). 35. **TO PUT in practice.** To use; to exercise (*Dryden*). 36. **TO PUT off.** To divest; to lay aside (*Addison*). 37. **TO PUT off.** To defeat or delay with some artifice or excuse



(Boyle). 38. To **PUT** off. To delay; to defer; to procrastinate (*Wake*). 39. To **PUT** off. To pass fallaciously (*Swift*). 40. To **PUT** off. To discard (*Shakspeare*). 41. To **PUT** off. To recommend; to vend or obtrude (*Bacon*). 42. To **PUT** on or upon. To impute; to charge. 43. To **PUT** on or upon. To invest with, as clothes or covering (*Ben Jonson*). 44. To **PUT** on. To forward; to promote; to incite (*Shakspeare*). 45. To **PUT** on or upon. To impose; to inflict (*L'Estrange*). 46. To **PUT** on. To assume; to take (*Shakspeare*). 47. To **PUT** over. To refer (*Shakspeare*). 48. To **PUT** out. To place at usury (*Child*). 49. To **PUT** out. To extinguish (*Milton*). 50. To **PUT** out. To emit, as a plant (*Bacon*). 51. To **PUT** out. To extend; to protrude (*Genesis*). 52. To **PUT** out. To expel; to drive from (*Spenser*). 53. To **PUT** out. To make public (*Dryden*). 54. To **PUT** out. To disconcert (*Bacon*). 55. To **PUT** to. To kill by; to punish by (*Shakspeare*). 56. To **PUT** to. To refer to; to expose (*Bacon*). 57. To **PUT** to it. To distress; to perplex; to press hard (*Addison*). 58. To **PUT** to. To assist with (*Sidney*). 59. To **PUT** to death. To kill (*Bacon*). 60. To **PUT** together. To accumulate into one sum or mass (*Burnet*). 61. To **PUT** up. To pass unrevenged (*L'Estrange*). 62. To **PUT** up. To emit; to cause to germinate, as plants (*Bacon*). 63. To **PUT** up. To expose publicly: as, these goods are put up to sale. 64. To **PUT** up. To start from a cover (*Addison*). 65. To **PUT** up. To hoard (*Spelman*). 66. To **PUT** up. To hide (*Shakspeare*). 67. To **PUT** upon. To impose; to lay upon (*Shakspeare*). 68. To **PUT** upon trial. To expose or summon to a solemn and judicial examination (*Arbutnot*).

To **PUT** v. n. 1. To go or move (*Bacon*). 2. To steer a vessel (*Addison*). 3. To shoot or germinate (*Bacon*). 4. To **PUT** forth. To leave a port (*Shakspeare*). 5. To **PUT** forth. To germinate; to bud (*Shakspeare*). 6. To **PUT** in. To enter a haven (*Pope*). 7. To **PUT** in. To offer a claim (*Shakspeare*). 8. To **PUT** in for. To claim; to stand candidate for (*Locke*). 9. To **PUT** off. To leave land (*Addison*). 10. To **PUT** over. To sail cross (*Abbot*). 11. To **PUT** to sea. To set sail; to begin the course (*Bacon*). 12. To **PUT** up. To offer one's self a candidate (*L'Estrange*). 13. To **PUT** up. To advance to; to bring one's self forward (*Swift*). 14. To **PUT** up with. To suffer without resentment.

**PUT** s. (from the verb.) 1. An action of distress (*L'Estrange*). 2. A rustic; a clown (*Bramston*). 3. A game at cards. 4. **PUT** off. Excuse; shift (*L'Estrange*).

**PUT**, a game on playing cards, played with a complete pack, generally by two people, sometimes by three, and often by four, is a game at which the cards rank differently from all others, tray being the best, next the deuce, then ace, king, and so on in the usual order as at whist. After cutting for deal, &c. at which the highest put-card wins, three cards, by one

at a time, are given to each player, then the game is played in the following way. If the non-dealer throw up his cards, he loses a point, if he play, and the dealer does not lay down another to it, he gains a point; but, should the dealer either win the same, pass fit, or lay down one of equal value, forming what is styled a tie, the non-dealer is still at liberty to put, that is play, or not, and his opponent then only gains a point; then if both parties agree to go on, whoever gains all the tricks or two out of three, wins five points, which are the game; if each player obtains one trick, and the third is a tie, then neither party scores.

Four-handed put differs only in that any two of the players give each their best card to his partner, who then lays out one of his, and the game is afterwards played as in two-handed put.

If the dealer turn up any of his adversary's cards, another deal may be demanded; but, when he shews his own, he is to abide by them: and should a faced card occur, the pack must be shuffled and dealt again: when more cards than necessary are given to the non-dealer, he may either claim a fresh deal, or have the extra cards drawn out; but should the dealer give himself too many, then his opponent is entitled to a point, and may either have another deal, or draw the supernumerary cards. By-standers ought never to interfere, under penalty of paying the stakes. Either party saying *I put*, must abide the event of the game, or pay the stakes.

**PUTAGE** s. (*putain*, Fr.) In law, prostitution on the woman's part.

**PUTAMEN**. The shell of a nut and other fruits allied to it.—Hence

**PUTAMINEÆ**. The name of the thirty-first order in Linnéus's fragments, and of the twenty-fifth in his natural orders.

**PUTANISM** s. (*putanisme*, Fr.) The manner of living, or trade of a prostitute.

**PUTATIVE** a. (*putatif*, Fr. from *puto*, Lat.) Supposed; reputed (*Ayliffe*).

**PUTEOLI** (*Livy*, *Strabo*), a town of Campania; so called either from its wells, there being many hot and cold springs thereabouts, or from its stench, *putor*, caused by sulphureous exhalations (*Varro*, *Strabo*). It is now called *Puzzuoli*, and is pleasantly and advantageously situated for trade. In a very remote age, the Cumeans made it their arsenal and dockyard; and to this naval establishment gave the sublime appellation of *Dicearchia* or Just Power.

The Romans were well aware of the utility of this port, and took great pains to improve its natural advantages. Nothing remains of their works but a line of piers, built to break the force of a rolling sea: they are vulgarly called the bridge of *Caligula*, because that madman is said to have marched in triumph from *Puzzuoli* to *Baia* on a bridge, but his was a bridge of boats.

The ruins of its ancient edifices are widely spread along the adjacent hills and shores. An amphitheatre still exists entire in most of its

parts, and the temple of Serapis offers many curious subjects of observation; half of its buildings are still buried under the earth thrown upon it by volcanical commotions, or accumulated by the crumbings of the hill; the inclosure is square, environed with buildings for priests and baths for votaries; in the centre remains a circular platform, with four flights of steps up to it, vases for fire, a central altar, rings for victims, and other appendages of sacrifice, entire and not displaced; but the columns that held its roof have been removed to the new palace of Caserta. Behind this round place of worship stand three pillars without capitals, part of the pronaos of a large temple; they are of cipolline marble, and at the middle of their height are full of holes eaten in them by the file-fish.

The present city contains near 10,000 inhabitants, and occupies a small peninsula; the cathedral was a pagan temple, dedicated to the divinities that presided over commerce and navigation. Lon. 14. 40 E. Lat. 41. 15 N.

In the neighbourhood of Puteoli are many relics of ancient grandeur, of which none deserves more attention than the Campanian way paved with lava, and lined on each side with venerable towers, the repositories of the dead, which are richly adorned with stucco in the inside. This road was made in a most solid expensive manner by order of Domitian, and is frequently the subject of encomium in the poems of Statius.

**PUTEOLANA**, in mineralogy, a genus of the class earths, order argillaceous. Consisting of alumina, silica and iron, with generally some carbonat of lime; friable; mixed up with water and quicklime becoming so hard as not to be penetrated by water; easily melting in the fire into a black scoria. Three species.

1. *P. genuina*. Puzzolano; pozzolano; pouzzolano. Of a dull colour, tinged, readily obeying the magnet. Found in the volcanic mountains of Italy, even in those that are extinct, chiefly about Naples and Rome, where it is collected into tumular masses; colour dull red, brown or black; surface rough, uneven, and of a baked appearance; fracture uneven, or earthy and porous; not diffusible in cold water, but in boiling water gradually depositing a fine earth; with a small portion of lime it makes an excellent mortar, which hardens even under water.

2. *P. assimilis*. Of a dull colour, tinged, hardly obeying the magnet. Found near Chernavari in France, in Germany, and Franconia, and probably originates from decayed argillaceous stones.

3. *P. Cineres*. Volcanic ashes. Cinereous, in the form of ashes. Found in the neighbourhood of most volcanic mountains, from which they are ejected with vast force, and often to a great height and distance, frequently covering extensive surfaces, and sometimes burying whole cities; occasionally so subtle as to fill up the minutest crevices; colour brownish or reddish-grey; they effervesce

slightly with acids, have frequently a magnetic power, and usually contain about half their weight of argil, a small proportion of calx, magnesia and iron, the remainder is silex.

**PUTID.** *a.* (*putidus*, Lat.) Mean; low; worthless (*L'Estrange*).

**PUTIDNESS.** *s.* (from *putid*.) Meanness; vileness.

**PUTLOG.** *s.* *Putlogs* are pieces of timber or short poles, about seven feet long, to bear the boards they stand on to work, and to lay bricks and mortar upon (*Moxon*).

**PUTRE'DINOUS.** *a.* (from *putredo*, Lat.) Stinking; rotten (*Floyer*).

**PUTREFACTION.** The spontaneous process of decomposition which takes place in all the soft parts of animals, and in some vegetables under proper circumstances of temperature and moisture, by which they are finally disorganized, and are chiefly resolved, when with access of air, into a variety of gaseous and volatile compounds, which mingle with the atmosphere.

The doctrine of this process is still very obscure; or in other words though we know the requisite circumstances and many of the products, we are very far from possessing exact ideas concerning the mode in which the constituent parts of the animal body break up their former combinations, and produce new ones altogether different. The process of putrefaction is indeed extremely slow; and the insuperable disgust and loathing attending it seem almost to forbid a very minute inquiry into its progress. Yet it has not been altogether neglected. Becher and Stahl have described with fidelity the phenomena with which it is attended, and the circumstances necessary for its taking place. To sir John Pringle we are indebted for some important experiments on the method of retarding putrefaction; neither are the experiments of Dr. Macbride less valuable, though the consequences which he drew from them were erroneous. We are indebted also to Crell and Priestley for many valuable facts; and to Berthollet and Lavoisier for the first attempts to determine the real changes which take place, and the manner in which the new products which appear during putrefaction are formed. But notwithstanding the labours of these philosophers, and of many others, much is still wanting to enable us to trace the complicated changes which take place during putrefaction, and to account for them in a satisfactory manner.

It has been ascertained long ago, that putrefaction never takes place in those animal substances which contain only two or three ingredients, such as oils, resins, sugar; they must always be more complicated in their texture; and, perhaps, in all cases, a mixture of two or more compound bodies is necessary for speedy decomposition. But however complicated the animal substance may be, it does not putrefy unless moisture is present; for dry animal substances are not susceptible of alteration. A certain degree of heat is also necessary. Animal bodies may be kept without decomposing



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for any length of time at the freezing temperature. In general the higher the temperature, the more rapid is the putrefaction, provided the heat is not great enough to reduce the animal body to dryness. It has been observed, too, that putrefaction advances with more rapidity in the open air; but exposure to the air is not necessary, though it modifies the decomposition.

When these conditions are observed, and dead animal matter is left to itself, its colour becomes gradually paler, and its consistence diminishes; if it is a solid part, such as flesh, it softens, and a serous matter sweats out, the colour of which quickly changes; the texture of the part becomes relaxed, and its organization destroyed; it acquires a disagreeable smell; the substance gradually sinks down, and is diminished in bulk; its smell becomes stronger and ammoniacal. If the subject is contained in a close vessel, the progress of putrefaction, at this stage, seems to slacken; no other smell but that of a pungent alkali is perceived; the matter effervesces with acids, and converts syrup of violets to a green. But if the communication with the air is admitted, the urinous exhalation is dissipated, and a peculiar putrid smell is spread around with a kind of impetuosity; a smell of the most insupportable kind, which lasts a long time, and pervades every place, affecting the bodies of living animals after the manner of a ferment, capable of altering the fluids; this smell is corrected, and in a manner confined, by ammonia. When the latter is volatilized, the putrefactive process becomes active a second time, and the substance suddenly swells up, becomes filled with bubbles of air, and soon after subsides again. Its colour changes, the fibrous texture of the flesh being then scarcely distinguishable; and the whole is changed into a soft brown, or greenish matter, of the consistence of a poultice, whose smell is faint, nauseous, and very active on the bodies of animals. The odorant principle gradually loses its force; the fluid portion of the flesh assumes a kind of consistence, its colour becomes deeper, and it is finally reduced into a friable matter, rather deliquescent; which being rubbed between the fingers, breaks into a coarse powder like earth. This is the last state observed in the putrefaction of animal substances; they do not arrive at this term but at the end of a considerable time.

During this decomposition, a variety of gaseous bodies are emitted; these vary according to the substance exposed to putrefaction; but they consist chiefly of hydrogen gas, holding sulphur, phosphorus, and carbon, in solution; of ammonia, water, and carbonic acid, and perhaps also of azotic gas. Nitric acid seems in some cases to be formed and emitted. The earthy-like residuum, which remains after the decomposition is completed, consists of the fixed parts of the animal substance, mixed with charcoal, oil, and ammonia. Thus it appears that putrefaction consists in a total decomposition of the animal body; the elements of

which combine together two and two, and thus form a new set of less complicated bodies. But any attempt to explain the manner in which these changes take place would be exceedingly imperfect indeed; not only because we are ignorant of the strength of the affinities of the different elementary parts of animal bodies for each other, but because we do not even know the manner in which these elements are combined, and consequently we cannot know by what particular forces these compounds are destroyed.

In carcases buried in the earth, putrefaction takes place much more slowly; but it is scarcely possible to observe its progress with accuracy. The abdomen is gradually dilated with elastic fluids which make their appearance in it, and at last it bursts and discharges a horribly fetid and noxious gas; at the same time a dark-coloured liquid flows out. If the earth is very dry, and the heat considerable, the moisture is often absorbed so rapidly, that the carcase, instead of putrefying, dries, and is transformed into what is called a mummy.

Such are the phenomena when dead bodies are left to putrefy separately; but when great numbers of carcases are crowded together in one place, and are so abundant as to exclude the action of external air and other foreign agents, their decomposition is entirely the consequence of the reciprocal action of their ingredients themselves upon each other, and the result is very different. The body is not entirely dissipated or reduced to mould, but all the soft parts are found diminished remarkably in size, and converted into a peculiar saponaceous matter. This singular change was first accurately observed in the year 1786. See ADIPOCIRE.

The burial-ground of the Innocents in Paris having become noxious to those who lived in its neighbourhood, on account of the disagreeable and hurtful odour which it exhaled, it was found necessary to remove the carcases to another place. It had been usual to dig very large pits in the burial-ground, and to fill them with the carcases of the poorer sort of people, each in its proper bier; and when they were quite full, to cover them with about a foot deep of earth, and to dig another similar pit, and fill it in the same manner. Each pit held between one thousand and fifteen hundred bodies. It was in removing the bodies from these pits that this saponaceous substance was found. The grave-diggers had ascertained by long experience, that about thirty years were required before all bodies had undergone this change in its full extent. Every part of the body acquired the properties of this substance. The intestines and viscera of the thorax had completely disappeared; but what is singular enough, the brain had lost but little of its size or appearance, though it was also converted into the same substance.

This saponaceous matter was of a white colour, soft and unctuous to the touch, and melted, when heated, like tallow. It exhibited all the properties of a soap, containing,

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however, an excess of fatty matter. Fourcroy, who analysed it, found that it was composed of a fatty matter combined with ammonia, and that it contained also some phosphat of lime and ammonia. Diluted acids decomposed it, and separated the fatty matter; alkalies and lime, on the other hand, drove off the ammonia. When exposed to the air, it gradually lost its white colour; the ammonia, in a great measure, evaporated; and what remained had something of the appearance of wax. It absorbed water with great avidity, and did not part with it readily. Its white colour was owing to the presence of that liquid. The oily matter, when separated by means of a diluted acid, was concrete, and of a white colour, owing to the mixture of a quantity of water. When dried, it acquires a greyish-brown colour, with a lamellar and crystalline texture, like that of spermaceti; but if it has been rapidly dried, it assumes the appearance of wax. It melts when heated to 126°; when properly purified, by passing it through a linen cloth while fluid, it has scarcely any smell. Alcohol does not act upon it while cold, but at the temperature of 120° it dissolves it: when the solution cools, the fatty matter precipitates, and forms a gritty mass. With alkalies it forms a soap; and when set on fire it burns precisely like oil or fat, only that it exhales a more unpleasant odour.

Mr. Smith Gibbes found the same substance in the pit into which animal matters are thrown at Oxford after dissection. A small stream of water constantly passes through this pit; a circumstance which induced him to try whether animal muscle exposed to the action of a running stream underwent the same change. The experiment succeeded completely: he attempted, in consequence, to render this substance, to which he gave the name of spermaceti, useful in those manufactures which require tallow; but the fetid odour which it constantly exhales was an insurmountable objection. Attempts were indeed made to get over it; and a manufacture of Mr. Smith Gibbes's spermaceti was even established at Bristol.

Many attempts have been made to retard the destructive progress of putrefaction, in order to preserve animal bodies either as food or for other useful purposes; and several methods have been ascertained which prevent it from operating for a considerable time.

1. The freezing temperature is a complete preservation from putrefaction, as long as the animal substance is exposed to it. Hence the common practice of keeping meat in snow in the frozen climates of the north; and of packing fish in ice, and sending them in that state from Scotland to the London market.

2. Almost all bodies which have a strong affinity for water retard putrefaction for a longer or shorter time, doubtless by depriving the animal substances of their water, or preventing that liquid from acting upon these bodies in its usual manner. In this way the acids, sugar, alcohol, &c. seem to prevent or retard putrefaction.

3. It is well known that common salt is a powerful antiseptic. Hence the practice of salting meat, and the length of time which meat that has undergone this operation may be kept. Several other salts, especially nitre, possess the same property. In what manner these bodies act has not been ascertained; but they undoubtedly produce some chemical change upon the meat; for they alter its taste, its colour, and other sensible properties.

4. Many aromatics, such as camphor, resins, volatile oils, bitumens, and other similar bodies, act with considerable efficacy in preserving animal bodies from putrefaction. Hence their utility in embalming. In what the action of these substances consists has not been ascertained. Part of their efficacy is doubtless owing to the rapidity with which the animal substances to which they are applied lose their moisture; and something may be ascribed likewise to their odour, which keeps insects at a distance, and thus prevents the lodging of excrementitious matter, which always acts powerfully as a putrefactive ferment.

Some kinds of air are remarkably antiseptic, though this subject has not been so fully inquired into as could be wished. The most powerful of them in this respect is the nitrous air; next to it is fixed air; but the powers of the other airs are not so well known. It is probable that the antiseptic properties of fixed and nitrous air are owing to their quality of extinguishing fire, or at least that the principle is the same; but, till the nature of these two kinds of air be better known, little can be said with certainty on the subject.

Sir John Pringle made experiments to determine the powers of certain substances to promote or to prevent putrefaction. From these experiments he formed the following table, showing the relative antiseptic powers of the saline substances mentioned. Having found that two drams of beef put in a phial with two ounces of water, and placed in a heat equal to 90° of Fahrenheit's thermometer, became putrid in 14 hours, and that 60 grains of sea-salt preserved a similar mixture of beef and water more than 30 hours, he made the antiseptic power of the sea-salt a standard, to which he compared the powers of the other salts. The algebraic character + signifies that the substance to which it is annexed had a greater antiseptic power than is expressed by the numbers;

|                           |   |   |     |
|---------------------------|---|---|-----|
| Sea-salt, or the standard | - | - | 1   |
| Sal gem                   | - | - | 1 + |
| Vitriolated tartar        | - | - | 2   |
| Spiritus Mindereri        | - | - | 2   |
| Soluble tartar            | - | - | 2   |
| Sal diureticus            | - | - | 2 + |
| Crude sal ammoniac        | - | - | 3   |
| Saline mixture            | - | - | 3   |
| Nitre                     | - | - | 4 + |
| Salt of hartshorn         | - | - | 4 + |
| Salt of wormwood          | - | - | 4 + |
| Borax                     | - | - | 12  |
| Salt of amber             | - | - | 20  |
| Alum                      | - | - | 30  |



The quantities of spiritus Mindereri and of the saline mixture were such, that each of them contained as much alkaline salt as the other neutral salts.

Myrrh, aloes, asafoetida, and terra Japonica, were found to have an antiseptic power 30 times greater than the standard. Gum ammoniacum and sagapenum showed little antiseptic power.

Of all resinous substances, camphor was found to resist putrefaction most powerfully. Sir John Pringle believes that its antiseptic power is 300 times greater than that of sea-salt.

Camomile flowers, Virginian snake-root, pepper, ginger, saffron, contrayerva-root, and galls, were found to be 12 times more antiseptic than sea-salt.

Infusions of large quantities of mint, angelica, ground-ivy, green tea, red roses, common wormwood, mustard, and horseradish, and also decoctions of poppy heads, were more antiseptic than sea-salt.

Decoctions of wheat, barley, and other farinaceous grains, checked the putrefaction by becoming sour.

Chalk, and other absorbent powders, accelerated the putrefaction, and resolved meat into a perfect mucus.

**PUTREFACTIVE. a.** (from *putrefacio*, Lat.) Making rotten (*Wiseman*).

**To PUTREFY. v. a.** (*putrifier*, Fr. *putrefacio*, Lat.) To make rotten; to corrupt with rottenness (*Temple*).

**To Pu'TREFY. v. n.** To rot (*Bacon*).

**PUTRESCENCE. s.** (from *putresco*, Lat.) The state of rotting (*Brown*).

**PUTRESCENT. a.** (*putrescens*, Latin.) Growing rotten (*Arbuthnot*).

**PUTRID. a.** (*putride*, Fr. *putridus*, Lat.) Rotten; corrupt (*Waller*).

**PUTRID FERMENTATION.** The process by which a substance is decomposed and dissipated in the air, in the form of putrid gas. Every living body, when deprived of life, performs a retrograde process, and becomes decomposed. This is called fermentation in vegetables, and putrefaction in animals. The same causes, the same agents, and the same circumstances, determine and favour the decomposition in vegetables and animals, and the difference of the products which are obtained arises from the difference of the constituent parts of each. The requisites to this process are, 1. A certain degree of humidity. 2. The access of atmospheric air. 3. A certain degree of heat. See **PUTREFACTION**, as also **FERMENTATION**.

**PUTRID FEVER.** A species of typhus. See **TYPHUS GRAVIOR**.

**PUTRIDNESS. s.** (from *putrid*.) Rottenness (*Floyer*).

**PUTTTER. s.** (from *put*.) 1. One who puts (*L'Estrange*). 2. **PUTTER on.** Inciter; instigator (*Shakspeare*).

**PUTTINGSTONE. s.** In some parts of Scotland, stones are laid at the gates of great houses, which they call *puttingstones*, for trials of strength (*Pope*).

**PUTTOCK. s.** (derived by *Minshaw*, from *buteo*, Lat.) A buzzard (*Peacham*).

**PUTROCKS, or PUTTOCK SHROUDS,** in a ship, are small shrouds which go from the shrouds of the main-mast, fore-mast, and mizen-mast, to the top-mast shrouds; and if there be any top-gallant mast, there are puttocks to go from the top-mast shrouds into these. These puttocks are at the bottom seized to a staff, or to some rope which is seized to a plate of iron, or to a dead man's eyes, to which the lanniards of the fore-mast shrouds do come.

**PUTTY,** a white powder obtained by calcining an alloy of equal parts of tin and lead. The substance thus procured is true or genuine putty; it constitutes the base of most of the opaque enamels, and is used in giving a polish to metals, stones, and glass.

It is usually supposed that glaziers putty was originally composed of this genuine putty and oil; at present, however, it is nothing more than washed chalk or whiting mixed up with linseed oil; a kind of ductile paste is thus produced which is highly serviceable in fastening panes of glass into sashes, as it becomes hard after a few days exposure to the air.

**PUY,** a populous town of France, in the department of Upper Loire, seated on the mountain Anis, near the river Loire. The principal church is famous for a prodigious quantity of relics; and Our Lady of Puy is celebrated in the annals of superstition. The late canons of Puy have had kings and dauphins of France at their head. Puy has manufactures of lace and silk stuffs, and is 45 miles N.E. of Mende.

**PUYCERDA,** a strong town of Spain, in Catalonia, and capital of Cerdagna. It is seated between the Carol and Segra, in a plain, at the foot of the Pyrennees, 53 miles W. of Perpignan, and 67 N.W. of Barcelona. Lon. 1. 50 E. Lat. 42. 36 N.

**PUY-DE-DOME,** a department of France, containing part of the late province of Auvergne, and almost all Limagne, a territory 12 leagues long and six broad, one of the most fertile plains in France. The borders of this circular plain are mountains, once so many volcanoes, but now covered with habitations, herds, and flocks. Clermont is the capital.

**PUY-EN-ANJOU,** a town of France, in the department of Maine and Loire, 10 miles S.W. of Saumur, and 160 of Paris. Lon. 0. 13 W. Lat. 47. 6 N.

**PUYLAURENS,** a town of France, in the department of Tarn, eight miles S.W. of Castres, and 23 E. of Toulouse. Lon. 1. 57 E. Lat. 43. 35 N.

**To PUZZLE. v. a.** (for *postle*, from *pose*. *Skinner*.) 1. To perplex; to confound; to embarrass; to entangle; to gravel; to put to a stand; to tease (*Shakspeare*. *Clarendon*). 2. To make intricate; to entangle (*Addison*).

**To PuZZLE. v. n.** To be bewildered in one's own notions; to be awkward (*L'Estrange*).

**PuZZLE. s.** (from the verb.) Embarrassment; perplexity (*Bacon*).

**PUZZLER.** *s.* (from *puzzle*.) He who puzzles.

**PUZZOLANA**, or **POZZULANA**, a kind of earth found about Puteoli, Baiæ, and Cumæ, in the kingdom of Naples. It is thrown out from the burning mouths of volcanoes, in the form of ashes; sometimes in such large quantities, and with so great violence, that whole provinces have been covered with it at a considerable distance. Puzzolana is of a grey, brown, or blackish colour; of a loose, granular, or dusty and rough, porous or spongy texture, resembling a clay hardened by fire, and then reduced to a gross powder. It has various heterogeneous substances mixed with it. Its specific gravity is from 2.5 to 2.8; and it is, in some degree, magnetic: it scarcely effervesces with acids, though partially soluble in them. It easily melts *per se*; but its most distinguishing property is, that it hardens very suddenly when mixed with one-third of its weight of lime and water; and forms a cement which is more durable in water than any other. According to Bergman's analysis, 100 parts of it contain from 55 to 60 of siliceous earth, 20 of argillaceous, 5 or 6 of calcareous, and from 15 to 20 of iron. Its effects, however, in cement may perhaps depend only on the iron which has been reduced into a particular substance by means of subterraneous fires; evident signs of which are observable in the places where it is obtained. See **PUTEOLANA**.

**PUZZUOLI.** See **PUTEOLI**.

**PYANEPSIA**, an Athenian festival, celebrated in honour of Theseus and his companions after their return from Crete. Some suppose, that it was observed in commemoration of the Heraclidæ.

**PYCNOGONUM**, in the entomology of Fabricius, a tribe of the genus **PHALANGIUM**, which see.

**PYCNOTYLE**, in the ancient architecture, is a building where the columns stand very close to each other; only one diameter and a half of the column being allowed for the intercolumniations. According to Mr. Evelyn, the pycnostyle chiefly belonged to the composite order, and was used in the most magnificent buildings; as at present in the peristyle at St. Peter's at Rome, which consists of near 300 columns; and in such as yet remain of the ancients, among the ruins of Palmyra.

**PYCNOTICS.** (from *πυκνω*, to condense.) Incrassant or astrigent medicines.

**PYDNA**, a town of Macedonia, where Cassander massacred Olympias the mother of Alexander the Great, his wife Roxane, and his son Alexander. Pydna is famous for a battle fought there, B. C. 168, between the Romans under Paulus and king Philip, in which the latter was conquered.

**PYGARGUS**, in ornithology. See **FALCO**.

**PYGMÆI**, a nation of dwarfs, in the extreme parts of India, or in Æthiopia. Some authors affirm, that they were no more than one foot high. Aristotle says that they lived under the earth, and that they came out in the

harvest time with hatchets to cut down the corn as if to fell a forest. They made war against certain birds, called cranes, which came yearly from Scythia to plunder them. They were originally governed by a princess, who was changed into a crane, for boasting herself fairer than Juno.

**PYGMALION**, in fabulous history, a king of Tyre, son of Belus, and brother to the celebrated Dido, who founded Carthage. He became odious by his cruelty and avarice. He murdered Sichæus, Dido's husband, because he was the most powerful and opulent of the Phœnicians, but, instead of obtaining the riches which he desired, Pygmalion was shunned by his subjects, and Dido, to avoid his cruelty, fled with her husband's treasure, and a large colony to Africa, where she founded a city. (See **CARTHAGE**.)—Pygmalion died in the 56th year of his age, and in the 47th of his reign.—2. A celebrated statuary of the island of Cyprus, who, according to the mythologists, became enamoured of a beautiful statue of marble which he had made, and at his request the goddess of beauty changed the statue into a woman, whom he married.

**PYGMÆAN.** *a.* (from *pigmy*.) Belonging to a pigmy (*Milton*).

**PYGMY.** *s.* (*pygmæe*, Fr. *πυγμαῖος*.) A dwarf; one of a nation fabled to be only three spans high, and after long wars to have been destroyed by cranes. See **PIGMÆI**.

**PYLADES.** The most celebrated of this name is a son of Strophius, king of Phocis, by one of the sisters of Agamemnon. He was educated, together with his cousin Orestes, with whom he formed the most inviolable friendship, and whom he assisted to revenge the murder of Agamemnon, by assassinating Clytemnestra and Ægisthus. He also accompanied him into Taurica Chersonesus, and for his services Orestes rewarded him, by giving him his sister Electra in marriage. The friendship of Orestes and Pylades became proverbial. See **ORESTES** and **ELECTRA**.

**PYLÆ**, a town of Asia, between Cappadocia and Cilicia (*Cic.*).—The word *Pylæ*, which signifies gates, was often applied by the Greeks to any streights or passages which opened a communication between one country and another, such as the streights of Thermopylæ, or Persia, Hyrcania, &c.

**PYLE** (Thomas), M. A. was born near Holt, Norfolk, 1674, and educated at Caius college, Cambridge. He was minister of King's Lynn, and engaged warmly in the Bangorian controversy, and for his services was made prebendary of Salisbury, by Dr. Hoadly, and two of his sons also were presented to prebends in the church of Winchester. His paraphrase on the acts, and all the epistles, is an excellent work. He published besides 3 vols. of sermons, and died 1757.

**PYLORIC ARTERY.** A branch of the hepatic artery.

**PYLORUS.** (*πυλωρος*, from *πύλω*, to guard an entrance; because it guards, as it were, the entrance of the bowels.) The inferior aperture



of the stomach, which opens into the intestines.

**PYLOS**, a town of Messenia, situate on the western coast of the Peloponnesus, opposite the island Sphacteria in the Ionian sea. It was built by Pylos, at the head of a colony from Megara.—2. A town of Elis, at the mouth of the river Alpheus, between the Peneus and the Selleis.—3. Another town of Elis. These three cities disputed their respective right to the honour of having given birth to the celebrated Nestor son of Neleus.

**PYRACANTHA**, in botany. See **MES-PILUS**.

**PYOSIS**. (from *πυος*, pus.) Suppuration. See **PUS**.

**PYRALIS**, in entomology, a tribe of the genus *phalæna geometra* in the system of Gmelin; and a distinct tribe in the system of Fabricius. See **PHALÆNA**.

**PYRAMID**, *s.* (*pyramide*, Fr. *pyramide*.) A solid figure, whose base is a polygon, and whose sides are plain triangles, their several points meeting in one, called the **vertex** of the pyramid.

Hence the superficies of a given pyramid is easily found by measuring these triangles separately; for their sum added to the area of the base, is the surface of the pyramid required.

It is no less easy to find the solid content of a given pyramid; for the area of the base being found, let it be multiplied by the third part of the height of the pyramid, or the third part of the base by the height, and the product will give the solid content, as is demonstrated by Euclid, lib. 12. prop. 7.

If the solid content of a frustum of a pyramid is required, first let the solid content of the whole pyramid be found; from which subtract the solid content of the part that is wanting, and the solid content of the frustum or broken pyramid will remain. See **FRUSTUM**.

Every pyramid is equal to one-third of its circumscribing prism, or one that has the same base and height. All pyramids are in a ratio compounded of their bases and altitudes; so that, if their bases are equal, they are in proportion to their altitudes; and vice versa.

Equal pyramids reciprocate their bases and altitudes; that is, the altitude of one is to that of the other, as the base of the one is to that of the other.

**PYRAMID**, in architecture: this form we derive from the Egyptians, a people who conceived and executed unparalleled works, which are, however, more remarkable for their strength and durability than elegance of outline, and beauty of execution. According to Herodotus, the people alluded to considered the pyramidal form as emblematic of human life, the broad base representing the commencement, and the gradation, to a point, the termination of our existence in the present state; hence they used it for sepulchral purposes: it would be absurd to contradict this assertion, as the period of their erection is too remote for enquiry, with any probable success: but there is another obvious reason for the adoption of

the shape, which of all others is most decidedly calculated to resist the operations of time. Admitting a monarch to have conceived an idea of rendering his tomb almost everlasting, it was impossible to invent an outline less liable to injury from the assaults of wind and rain, and the very disposition of the stones made it impossible that it should fall even through the operations of an earthquake, besides the immense extent of their bases, and the solidity of the workmanship made it highly improbable that his successors, or the people, would be at the trouble and expense of destroying it through disrespect to his memory; this circumstance, perhaps, united with the former consideration, were sufficient inducements for the selection of the pyramid for monuments.

Some authors derive the word from the Greek for wheat and its receptacle, and those assert that pyramids were originally built by the Patriarch Joseph as granaries; others derive it from the word *πυρ*, fire, thinking that the pyramidal shape resembles the ascent of flame. Many writers are of opinion that the Egyptian pyramids were erected by the children of Israel during their slavery. The last of them, it is well known, bears strong indications of the unfinished state in which the enterprize was left by the workmen: it appears to have been suddenly abandoned by those employed on it. Profane historians, also, name the chiefs of the Hebrew people as the builders of these mountainous works.

Of these pyramids those at Gizeh are the most gigantic; and the most enormous, or the great pyramid, is situated near Memphis. Herodotus says, he was informed the latter covered the remains of Cheops, and another adjoining those of his brother Cephrenes, who succeeded him; the first only having inner galleries, or passages. Although much dependence cannot be placed upon the further accounts of this ancient writer, it seems highly probable that an 100,000 men may have been constantly employed, for 20 years, in erecting the immense pile, and that Cheops became detested by the people, who were thus taken from more useful employments, as well as by the bulk of the population, who found the taxes demanded of them appropriated to a purpose utterly unproductive of future advantage.

When M. Savary visited the pyramids of Gizeh, the country was under the government of its present natives, whose kiaschif, or governor, for the above district, exacted a small tribute from travellers, and in return provided them with an escort, as a protection against the Arabs, who seized every opportunity to plunder them. The gentleman just mentioned, accompanied by some friends and the guards furnished by the kiaschif, departed from Gizeh at an hour after midnight, and were soon after gratified with a view of the two greatest pyramids, on the summits of which the moon shone with full splendour; as they approached them they assumed the appearance of vast pointed rocks penetrating the clouds. At half an hour past three in the morning the company

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prepared to enter the passages of the great pyramid by taking off great part of their clothing, and each taking a lighted torch in their hands, thus prepared they began a long descent, which at last became so much contracted that the party were compelled to crawl upon their hands and knees; this terminating, they commenced an ascent nearly under the same uncomfortable circumstances, except that they proceeded on their knees, and made use of their hands against the sides to facilitate their progress, and this mode of getting forward was necessary, as the stone at the bottom of the passage did not afford sufficient level for a firm step; when in this dismal gallery they were so imprudent as to discharge a pistol, the report of which long echoed and re-echoed through the place, and alarmed numbers of bats who darted against them and extinguished some of their torches. Succeeding in their efforts, they arrived at the upper termination of the second passage, where they passed through a very small door into a large oblong apartment, entirely composed of granite, seven enormous blocks of which formed the ceiling.

At one extremity of this apartment M. Savary saw an empty marble sarcophagus composed of one piece, but without a lid, and fragments of earthen vases lay scattered over the floor of the room; they also visited a second chamber, situated beneath that just described, and of smaller dimensions, which contained the entrance of a conduit then filled with rubbish. Satisfied with the progress they had made, the party descended by the passage already noticed, and with some difficulty avoided a deep and dangerous well on their left hands; on their arrival in the open air, each person observed that his companions were pale and exhausted by the heat they endured when immured within the frightful abyss they had just explored.

After having rested their weary limbs, and recovered their strength and spirits, the party began to ascend the exterior of the pyramid, which consists, according to their enumeration, of above 200 gradations of stone, varying from two to four feet in height. This operation, fatiguing, and severely laborious, occupied an hour; but on their reaching the summit they had the satisfaction of seeing that the rays of the approaching sun were darted on the points of Mokaltam, and not long after they beheld it rise from behind that mountain; the landscape, thus illuminated, they perceived, with infinite pleasure, the Nile, and the adjoining fruitful fields, Gizeh, Grand Cairo, and part of the Delta, forming a striking contrast with the remainder of the view composed of sterile hills and wide spreading sands, with the intervening pyramids of Sakkara, three leagues from their then situation.

Fully sated with the rich prospect before them, they cut their names on the upper stones of the pyramid, and descended with the utmost caution, as this was a far more dangerous undertaking than the ascent: having reached the base in safety, they paced round it and contem-

plated the rugged mass with terror, which strongly resembled a vast pile of detached rocks when near it, but at a distance, the inequalities are lost, and the sides appear plain surfaces. The form of this immense monument prevents an accurate measurement of its dimensions, without severe labour and imminent danger; consequently, those authors who give them may have judged from mere conjecture. Herodotus mentions its reputed height, in his time, to have been 800 feet, and the width of each side of the base the same; Strabo made it 625 feet; but Diodorus reduces it to 600; modern observers have agreed with Strabo, and some of those bring it below Diodorus; if, however, an average may be permitted of these various accounts, that will amount to more than 500 feet.

One cause of the difference between the assumed heights is, that the pyramid is measured or observed on different sides; the north-east angle is most frequently ascended, being the least damaged, but this part is exposed to the deserts of Libya, whence vast quantities of sand are driven by the wind against it, and the number of visible gradations are diminished by its accumulation; it is, therefore, evident, that all admeasurements should be made at the opposite angle, where it is probable the rise in the earth has been less considerable, and yet to arrive at any degree of accuracy that should be ascertained by digging. Strabo mentions that the stone which closed the entrance to the apartments within the pyramid, was situated nearly half way up one of the sides; were this the fact, a very great rise in the neighbouring earth must have occurred, as it now appears to be not more than 100 feet from the base. Herodotus informs us, that the great and next pyramid, in size, were covered with white marble; and Diodorus and Pliny supposed they were wholly formed of that rich material: enough still remains on both to confirm the truth of the former assertion, which has escaped the labours of the Arabs, to whose indefatigable researches to discover supposed treasures within we are indebted for the finding the entrance to the passage, and that the pyramid was intended as a sepulchral monument for the Egyptian princes.

Denon, who accompanied the ever-memorable expedition from France to Egypt, is the last visitor of the pyramids, and to him we are obliged for the following particulars of their present state.

General Buonaparte had determined to examine the great pyramids of Gizeh, and ordered an escort of near 300 men; Denon had the address to become one of the party, and they proceeded on the undertaking rather late in the day, owing to the difficulty of assembling the persons who composed it. Boats were procured to convey them, and they passed through the inundating trenches of the Nile to the boundary of the desert, within half a league of the pyramids. As they approached them Denon perceived that their sloping and angular forms had the effect of reducing their real height, which the eye was thus prevented from measuring with accu-



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racy; besides as there are no other objects in their vicinity by which a comparison can be made, the mind is led to think of nature's grandest production, the mountain, and in consequence the pyramid shrinks into insignificance. This impression was, however, very soon effaced, for as Denon advanced he saw an 100 persons assembled near the base, the deception instantly vanished, a comparison was formed, and the stupendous pile assumed all its appropriate majesty.

The party ascended a small heap of rubbish and sand, the probable remains of the trench of the first of these edifices which presents itself, and now conducting to the opening through which it may be reached, this aperture, said by Denon to be about 60 feet from the base, is hidden by a general facing of stone, forming the third or inner enclosure to the solitary entrenchment surrounding the pyramid. Large stones are laid horizontally on the sides of the entrance, and above those are others of enormous size, fitted at the ends so as to lean against each other, by this means rendering their fall or derangement impossible through the superincumbent weight. Hence commences the first gallery with a direction towards the centre and base of the monument; this gallery is now greatly clogged with the drifted sand of the desert, and the rubbish originally made by the efforts to explore the secrets of the edifice, it is consequently difficult of access. "At the extremity of this gallery," says Denon, "two large blocks of granite are met with, which form a second partition to this mysterious passage." The interruption made by those in the progress of past research was such, that various fruitless attempts have been made to surmount the impediment, and some have even had the folly to cut into the solid mass composing the pyramid, "but this proving unsuccessful, they have returned some way, have passed round two blocks of stone, climbed over them, and thus discovered a second gallery of so steep an ascent, that it has been necessary to hew steps in the ground in order to mount it. This gallery leads to a kind of landing-place in which is a hole usually called the well, which is the opening to an horizontal gallery leading to a chamber known by the name of the queen's chamber, without ornament, cornice, or any inscription whatever.

"Returning to the landing-place, an aperture, in a perpendicular direction, leads to the principal gallery, and this terminates in a second landing-place where a third and last partition is situated; as this is constructed with a greater degree of architectural care and propriety than the rest of the building, it may be inferred that the Egyptians considered it proper to guard the immediate deposit of their dead with peculiar attention.

"Lastly comes the royal chamber, containing the sarcophagus, a narrow sanctuary, which is the sole end and object of an edifice so stupendous, so colossal."

Mr. Bryant is of opinion that the pyramids

were temples erected in honour of the Deity; and a very ingenious writer in the Gentleman's Magazine for June 1794 has done much to prove that they were altars dedicated to the sun, the first and greatest god in every pagan calendar.

"Our English word pyramid (says he) is directly derived from the Latin *pyramis*, and mediately from the Greek *πυραμς*; all denoting the same mathematical figure. The original of the whole seems to be the Egyptian word *pyramoua*, which, we are told by Oriental scholars, signifies light, or a ray of light. From this Coptic vocable the word *πυρ* in Greek, signifying fire, is probably descended; as the flames of fire assume that conical or pyramidal form which the solar rays commonly display; and as it is natural for the mind to distinguish its objects rather by their external qualities, and those obvious and interesting appearances which they exhibit to the senses, than by their constituent and inseparable properties.

"The ancient Egyptians seem to have penetrated very far into the mysteries of nature; and although their superstition appears at first sight to be extremely gross and absurd, yet it is very probable that their deities were only emblematical personages, representing by sensible images the grand effects or presiding principles which they supposed to exist in the universe. Thus the moon was called Isis, and the sun Osiris; and to the honour of this last deity, from whose visible influence and creative energy all things seem to spring into existence, it is not improbable that the Egyptians erected those stupendous monuments, and dedicated them to him as temples or altars. It was natural to build them in that shape which the rays of the sun display when discovered to the eye, and which they observed to be the same in terrestrial flame, because this circumstance was combined in their imaginations with the attribute which they adored. If they were temples dedicated to the sun, it seems a natural consequence that they should likewise be places of sepulture for kings and illustrious men, as the space which they covered would be considered as consecrated ground. This hypothesis is common, and is not contradicted by the present reasoning. But, considering them as altars, and as most travellers agree that they were never finished, but terminate in a square horizontal surface, it would not be refining too much to venture an assertion that, in great and solemn acts of adoration, the Egyptians constructed fires, the flames of which should terminate in the vertex of the pyramid, and so complete that emanation of their deity which they admired and adored. As far, therefore, as we are justified in forming any conclusion on so dark a subject, we may venture to say, that the Egyptian pyramids were temples or altars dedicated to the sun, as the material representative of that invisible power which creates, governs, and pervades, the whole system of nature."

Another ingenious investigator, Mr. Clarkson, has been recently delivering an interesting

course of lectures on the pyramids, to the London Philosophical Society, at their rooms in Crane-court, in which he has completely established the point that they were not sepulchres, (as has been usually imagined) but temples dedicated to the mysteries of solar fire. For a tolerably copious analysis of Mr. Clarkson's disquisitions, see Tilloch's Philosophical Magazine, No. 166.

**PYRAMIDAL.** **PYRAM'DICAL.** *a.* (from *pyramid*.) Having the form of a pyramid (*Locke*).

**PYRAMIDAL NUMBERS** are the sums of polygonal numbers, collected after the same manner as the polygonal numbers themselves are extracted from arithmetical progressions. See **FIGURATE NUMBERS**.

These are particularly called first pyramidal. The sums of first pyramidal are called second pyramidal. And the sums of those third pyramidal; and so on, *ad infinitum*. Particularly those arising from triangular numbers are called prime triangular pyramidal; those arising from pentagonal numbers are called prime pentagonal pyramidal, &c.

The numbers 1, 4, 10, 20, 35, &c. formed by adding }  
the triangulars } 1, 3, 6, 10, 15, &c.  
are usually called simply by the name of pyramidal; and the general formula for finding

them is  $n \times \frac{n-1}{2} \times \frac{n-2}{3}$ ; so the 4th pyramid is found by substituting 4 for  $n$ ; the 5th by substituting 5 for  $n$ ; &c. See **FIGURATE NUMBERS**, and **POLYGONAL NUMBERS**.

**PYRAMIDALIS.** (from *πυραμις*, a pyramid.) In anatomy. Fallopius, who is considered as the first accurate describer of this muscle, first gave it the name of pyramidalis, from its shape. But Vesalius seems to have been acquainted with it, and to have described it as a part of the rectus. It is a very small muscle, situated at the bottom of the fore part of the rectus, and is covered by the same aponeurosis that forms the anterior part of the sheath of that muscle. It arises, by short tendinous fibres, from the upper and fore part of the pubis. From this origin, which is seldom more than an inch in breadth, its fibres ascend somewhat obliquely, to be inserted into the linea alba, and inner edge of the rectus, commonly at about the distance of two inches from the pubis, and frequently at a greater or less distance, but always below the umbilicus. In some subjects the pyramidalis is wanting on one or both sides, and when this happens, the internal oblique is usually found to be of greater thickness at its lower part. Now and then, though rarely, there are two at one side, and only one at the other, and M. Sabbatier has even seen two on each side. Fallopius, and many others after him, have considered it as the congener of the internal oblique; but its use seems to be to assist the lower part of the rectus.

**PYRAMIDALIS FACIEI.** See **LEVATOR LABII SUPERIORIS ALÆQUE NASI**.

**PYRAMIDICALLY.** *ad.* (from *pyramidal*.) In form of a pyramid (*Broome*).

**PYRAMIDOID**, is sometimes used for the parabolic spindle, or the solid formed by the rotation of a semiparabola about its base or greatest ordinate. See **PARABOLIC SPINDLE**.

**PYRAMUS**, in fabulous history, a youth of Babylon, became enamoured of Thisbe, a beautiful virgin, who dwelt in the neighbourhood. The flame was mutual, and the lovers, whom their parents forbid to marry, regularly interchanged sentiments through the chink of a wall, which separated their houses. They both agreed to elude the vigilance of their friends, and to meet at the tomb of Ninus, under a white mulberry tree, without the walls of Babylon. Thisbe came first to the appointed place, but the sudden arrival of a lioness frightened her away; and as she fled, she dropped her veil, which the lioness found and covered with blood. Pyramus soon arrived; he found Thisbe's veil bloody, and concluding that she had been torn to pieces by wild beasts, he stabbed himself. Thisbe, when her fears vanished, returned from the cave, and at the sight of the dying Pyramus, she fell upon the sword still reeking with his blood. The tree, as the poets mention, was stained with the blood of the lovers, and ever after bore fruit, but of the colour of blood.

**PYRBAUM**, a town of the upper palatinate of Bavaria, capital of a lordship of the same name. It is 13 miles S.E. of Nuremberg.

**PYRE.** *s.* (*pyra*, Latin.) A pile on which the dead are burnt (*Dryden*. *Pope*).

**PYRENE.** The most remarkable of this name is a daughter of Bebrycius, king of the southern parts of Spain. Hercules offered violence to her before he went to attack Geryon, and she brought into the world a serpent, which so terrified her, that she fled into the woods, where she was torn to pieces by wild beasts.—2. A small village in Celtic Gaul, near which, according to some, the river Ister took its rise.

**PYRENNEES**, mountains which form the boundaries between France and Spain, and extend from the Mediterranean to the Atlantic, about 200 miles in length, and, where widest, 100 in breadth, but under different names, and in a variety of branches. Over these mountains there are only five passages from one country to the other, the three principal of which are from St. Sebastian to St. Jean de Luz; from Pamplona to St. Jean de Luz; and from Jonqueira to Perpignan. These mountains yield great quantities of timber for shipping, which is conveyed, by means of the Ebro and other streams, to the sea, with abundance of pitch and tar. The Pyrennees give name to three of the French departments.

**PYRENNEES** (Eastern department of), one of the new divisions of France, bounded on the north by the department of the Arriege and



the Aude, on the east by the Mediterranean, on the south and west by Spain; about fifty-eight miles from east to west, and from eighteen to twenty-five from north to south. This tract was heretofore the province of Rousillon. Perpignan is the capital.

**PYRENNEES** (Lower department of), one of the divisions of France, bounded on the north by the department of the Landes and Gers, on the east by the department of the Upper Pyrennees, on the south by Spain, and on the west by the sea: seventy miles in length, and from fifteen to forty-five in breadth. It is composed of the provinces of Bearn, Navarre, and part of Gascony. Pau is the capital.

**PYRENNEES** (Upper department of), one of the divisions of France, bounded on the north by the department of the Gers, on the east by the department of the Upper Garonne, on the south by Spain, and on the west by the department of the Lower Pyrennees: fifty-three miles in length, and from twenty-five to thirty-eight in breadth; a small district towards the north is scarcely more than seven miles in breadth. This department is composed chiefly of the province of Bigorre. Tarbes is the capital.

**PYRENIUM**, in botany, a genus of the class cryptogamia, order fungi. Fungus globular, naked, entire, inclosing naked, conglomerate seeds like a nucleus. Four species; all exotics.

**PYRETHRUM**. Feverfew. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked; seeds crowned with a membranaceous margin; calyx hæmisphepherical, imbricate; the scales rather acute and scarious on the margin. Twenty-six species, scattered over the globe; two of them common to our own wastes or sea-coasts. They may be thus subdivided:

A. Ray of the flower white.

B. Ray of the flower yellow.

The ancient Romans, we are told, employed the root of this plant as a pickle. In its recent state it is not so pungent as when dried, yet if applied to the skin, it is said to produce inflammation. Its qualities are stimulant; but it is never used, except as a masticatory, for relieving tooth-achs, rheumatic affections of the face, and paralysis of the tongue, in which it affords relief by stimulating the excretory ducts of the salival glands.

**PYRETHRUM SYLVESTRE**. See **PTARMICA**.

**PYRETOLOGY**. (*πυρετολογία*, from *πυρ*, fire, or heat, and *λογος*, a discourse.) A discourse or doctrine on fevers.

**PYREXIA**. (*πυρεξία*, from *πυρ*, fire.) Fever.

**PYREXIE**. Febrile diseases. The first class of Cullen's nosology; characterised by frequency of pulse after a cold shivering, with increase of heat, and especially, among other impaired functions, a diminution of strength.

**PYRGOTELES**, a celebrated engraver on gems, in the age of Alexander the Great. He had the exclusive privilege of engraving the conqueror, as Lysippus was the only sculptor who was permitted to make statues of him.

**PYRIFORMIS**. (*pyriformis*, from *pyrus*,

a pear, and *forma*, a shape, shaped like a pear.) *Pyriformis*, seu *iliacus externus* of Douglas. In myology. Spigelius was the first who gave a name to this muscle, which he called *pyriformis*, from its supposed resemblance to a pear. It is a small radiated muscle, situated under the *glutæus maximus*, along the inferior edge of the *glutæus minimus*. It arises by three, and sometimes four tendinous and fleshy origins, from the anterior surface of the second, third, and fourth pieces of the *os sacrum*, so that this part of it is within the pelvis. From these origins the muscle grows narrower, and passing out of the pelvis, below the niche in the posterior part of the ilium, from which it receives a few fleshy fibres, is inserted, by a roundish tendon of an inch in length, into the upper part of the cavity at the root of the *trochanter major*. The use of this muscle is to assist in moving the thigh outwards, and in moving it a little upwards.

**PYRITES**, in mineralogy, a name first given by ancient mineralogists to the native sulphuret of iron, because, when struck against a piece of steel or other hard body, it gives out sparks of fire; and when heated red-hot, the sulphur that it contains burns with a lambent blue flame. It occurs massive, and frequently crystallized: the forms of its crystals are various, but the most common is the cube regular, or modified by truncation of the angles or edges, or acumination of three planes on the angles: the octaedron, dodecaedron, and icosaedron, also sometimes occur.

Its colour is brass-yellow, varying a little in the shade, and the lustre is always fully metallic: it is opaque. The fracture is uneven. It is brittle; its hardness is such as to strike fire with steel; its specific gravity is from 4.6 to 4.8. By friction it exhales a sulphureous smell. This odour is strong when it is heated before the blow-pipe; it gives at the same time a blue flame; and at length a globule of a brownish colour. It is soluble in nitric acid, with the disengagement of red vapours. It is not sensibly magnetic. Various analyses of it have been given: according to those executed by Mr. Hatchet, it consists of

|              |       |
|--------------|-------|
| Sulphur..... | 52    |
| Iron.....    | 48    |
|              | <hr/> |
|              | 100   |

Besides this variety, which may be named common pyrites, there are some others which differ principally in structure, or in the form under which they occur. The striated or radiated pyrites presents a striated fracture, the striae being generally diverging.

It is rather more liable to tarnish than the preceding, and decomposes more readily in a humid atmosphere. According to Mr. Hatchet's analysis, it consists of

|              |       |
|--------------|-------|
| Sulphur..... | 54    |
| Iron.....    | 46    |
|              | <hr/> |
|              | 100   |

## P Y R

The capillary pyrites occurs in delicate capillary crystals, grouped, parallel, diverging, or interwoven, slightly flexible, having a metallic lustre, and a colour passing from yellow to steel-grey. There is, lastly, the hepatic pyrites, so named from the liver-brown colour, which it assumes from exposure to the air. In the fresh fracture its colour is pale brass-yellow, inclining to steel-grey. It occurs massive, of various imitative forms, and crystallized in six-sided prisms, or six-sided pyramids; it has less lustre than the others, and is more subject to decomposition. What has been named magnetic pyrites, distinguished, as the name implies, by its magnetic quality, of which the others are destitute, has been considered as forming a distinct species. Its colour is deeper, being intermediate between brass-yellow and copper-red, and approaching even to brown, often tarnished: its lustre is also inferior, but is still metallic. It occurs only massive or disseminated. Its fracture is compact: it is hard and brittle: its specific gravity is 4.5. It appears from Mr. Hatchet's analysis of it to differ from the other iron pyrites, in containing a larger proportion of metal, to which, no doubt, its quality of being attracted by the magnet is owing.

Besides the ferruginous pyrites, modern mineralogists distinguish two other species, the cupreous and the arsenical, the former of which is a sulphuret of copper, and the latter a compound of ferruginous pyrites and arsenic. All, however, have a general resemblance in their external appearance, the colour varying in each of them from a yellowish white to a gold yellow; and they have all a high metallic lustre.

**PYRMONT**, a town of Westphalia, in a county of the same name, with a fine citadel. Near it are mineral waters, well known to all Europe, and often frequented by persons of the highest rank. It is seated in a delightful valley, between high mountains, 38 miles S.W. of Hanover. Lon. 9. 20 E. Lat. 51. 57 N.

**PYRMONT WATER.** A general view of the analysis of this water will show that it stands the first in rank of the highly carbonated chalybeates, and contains such an abundance of carbonic acid, as not only to hold dissolved a number of carbonic salts, but to show all the properties of this acid uncombined, and in its most active form. Pyrmont water is likewise a strong chalybeate, with regard to the proportion of iron; and it is besides a very hard water, containing much selenite and earthy carbonats. The diseases to which this mineral water may be advantageously applied are the same as those for which the spa and others of the acidulated chalybeates are resorted to, that is, in all cases of debility that require an active tonic that is not permanently heating; various disorders in the alimentary canal, especially bilious, vomiting, and diarrhæa, and complaints that originate from obstructed menstruation. See **MINERAL WATERS**.

**PYROCHROA.** In the entomology of Fabricius, a tribe of the genus **LAMPYRIS**, which see.

## P Y R

**PYROLA.** Winter-green. In botany, a genus of the class decandria, order monogynia. Calyx five-parted; petals five; capsule superior, five-celled, opening at the angles, many-seeded; anthers with two pores. Six species; four found wild in our own woods, one in America, and one in Europe, Asia and America.

**PYROLIGNEOUS ACID.** **PYROMUCOUS ACID.** **PYROTARTAREOUS ACID.** All these are empyreumatic acids, and differ but little from each other in taste, colour, or smell. They are obtained from a variety of vegetable substances heated strongly in close vessels so as to destroy their organization, and for the most part consist of a bitterish, pungent, and sour liquor, which is always more or less turbid and dark-coloured; incapable of crystallization; unites with alkalies, earths, and some metallic oxyds, forming, for the most part, brown and foul-looking compounds, generally deliquescent.

*Pyroligneous acid* is also called *ligneous acid*, and *acid of wood*. To procure it, distil in a glass or earthen retort any quantity of shavings of any kind of wood, as box, guaiacum, or beech, and adapt a large receiver, not closely luted. By this means, an extremely strong smelling, dark-coloured empyreumatic acid liquor will be obtained, nearly one-third of the weight of the wood. It is the sourest, and blackest, and most empyreumatic of all these acids, and seems to require a stronger heat than the rest for its production. It is obtained in large quantities near London from the preparation of charcoal for gunpowder, by distilling wood in cast-iron cylinders. It stains the hands deeply, and wood indelibly.

The *pyromucous acid* is also called *syrupous acid* and *empyreumatic acid of sugar*, which must be carefully distinguished from the proper acid of sugar or oxalic acid, which is quite another substance. The pungent acid vapour of sugar or any saccharine matter strongly heated must be familiar to all who have ever entered a sugar-baking house. It may be also prepared by putting into a glass retort any quantity of pulverized sugar of any kind, so as to fill only one eighth part of it, as the matter swells prodigiously in the process; a large, not closely luted receiver must be adapted to it; and it should be heated gradually on a sand-bath. A vast quantity of gas arises as the sugar begins to scorch, which is mostly carbonic acid mixed with an inflammable gas, probably the gaseous oxyd of carbon. In the receiver is condensed a weak acid brown liquor, coloured by an oily matter, and also apparently fouled by a portion of fuliginous matter volatilized during the distillation. The quantity of acid obtainable in this process varies according to the regulation of the fire, which should at least be pushed so as to make the retort red-hot, and to reduce the sugar to a perfect charcoal; but in general about five-eighths of the weight of sugar may be obtained of the distilled acid.

Gum mucilage, manna, honey, starch and other mucus, or muco-saccharine substances, yield by distillation the same acid as sugar.



The *pyrotartareous acid* is also sometimes called *emphyreumatic acid* of tartar, but must be carefully distinguished from proper tartareous acid, which is altogether of a different nature.

To procure the pyrotartareous acid, distil any quantity of cream of tartar in a glass or earthen retort, as in the last process; the retort in this case may be half full of the tartar. On raising the fire very slowly, the first product is a limpid, acidulous, somewhat bitterish water; after which, as the heat increases, a most prodigious volume of the inflammable gas is given out, together with a stronger acid, and more emphyreumatic liquid, and at last a black oil, and some volatile alkali. The whole quantity of liquid acid procured from tartar in this method is generally not more than about a quarter of the weight of the tartar, and is not quite so brown nor so highly emphyreumatic as in the former acid.

By purification, all these acids lose their distinctive characters, and are reduced to simple acetous acids; and as such are sometimes employed in the preparation of acetous ether; and at other times, even without much purification, in forming the acetited iron used as a mordant by the calico-printers. The distillation is one means of purifying them: newly burnt charcoal is still more powerful, and an union with lime or an alkali most of all.

**PYROMACHUS**, in mineralogy, a genus of the class earths, order siliceous. Consisting principally of silica, with a small portion of alumina, and oxyd of iron, and frequently a little carbonat of lime; hard, semi-transparent, lightish, of a conchoidal texture, breaking into indeterminate, very acute angled fragments, rarely separating into concentrically crustose fragments, with hardly any lustre, found chiefly in stratorial mountains, and rarely forming strata itself; not fusible *per se* before the blowpipe. Five species.

1. *P. cinereus*. Cinereous flint. Greyish, approaching to subopaque, and of a somewhat splintery texture. Found detached in Lusace, and on Mount Mosseburg in Westrogoth, covered with a hard, white, marmoreous crust; approaching to a petrosilex.

2. *P. striata*. White, of a texture approaching to fibrous. Found on the cretaceous hills of England.

3. *P. cretaceus*. Flint. Common flint. Tinged, semi-transparent, of a perfectly conchoidal texture. Found in Britain, France, Denmark, and other European countries, in detached pieces of various shapes and sizes, and generally covered with a white calcareous coat; most common among chalk, and often arrang-

ed in some kind of stratarial order; colour varying from honey-yellow to brownish-black, with variations often in the same specimen, in the form of veins, stripes, clouds, or dots; frequently contains petrifications, particularly of the crustaceous and small coralline kinds, and sometimes bears the impression of echinites and belemnites: when two pieces are rubbed smartly together, they phosphoresce and emit a peculiar odour; when heated, it decrepitates, and becomes white and opaque; specific gravity from 2,580 to 2,630: contains

|                        |       |
|------------------------|-------|
| Silica . . . . .       | 98,00 |
| Lime . . . . .         | 0,50  |
| Alumina . . . . .      | 0,25  |
| Oxyd of iron . . . . . | 0,25  |
| Water . . . . .        | 1,00  |

100, *Klaproth*.

4. *P. semipellucidus*. Light, nearly semi-transparent. Found in France, Wirtemberg, Franconia, and Iceland, generally mixed with the last, but more rare; colour white, honey-colour, reddish, blueish or variegated.

5. *P. crystallinus*. Crystallized in a three-sided depressed pyramid. Two varieties.

a. The pyramid simple. Found in Saxony, near Schneeberg.

b. The pyramid double. Found in Saxony, near Johanngeorgenstadt.

**PYROMANCY**. (*πυρομαντεία*.) A kind of divination performed by means of fire.

The ancients imagined they could foretel futurity by inspecting fire and flame: to this end they considered its direction, or which way it turned. Sometimes they added other matters to the fire, e. gr. a vessel full of urine, with its neck bound about with wool, watching narrowly on which side it would burst, and thence taking their augury.

**PYROMETER**. (formed of *πυρ*, fire, and *μετρον*, I measure.) In physics, the name of a machine contrived to measure the alteration of the dimensions of metals, and other solid bodies, arising from heat.

Muschenbroek was the first inventor of this instrument; though it has since received several improvements by other philosophers. He has given a table of the expansions of the different metals, with various degrees of heat. Having prepared cylindric rods of iron, steel, copper, brass, tin, and lead, he exposed them first to a pyrometer with one flame in the middle; then with two flames; then successively with three, four, and five flames. The effects were as in the following table: where the degrees of expansion are marked in parts equal to the 12500th part of an inch.

# P Y R O M E T E R.

| Expansion of                     | Iron | Steel | Copp. | Brass | Tin | Lead |
|----------------------------------|------|-------|-------|-------|-----|------|
| By 1 flame                       | 80   | 85    | 89    | 110   | 153 | 155  |
| By 2 flames                      | 117  | 123   | 115   | 220   |     | 274  |
| placed close together            |      |       |       |       |     |      |
| By 2 flames at 2½ inches distant | 109  | 94    | 92    | 141   | 219 | 263  |
| By 3 flames close together       | 142  | 168   | 193   | 275   |     |      |
| By 4 flames close together       | 211  | 270   | 270   | 361   |     |      |
| By 5 flames                      | 230  | 310   | 310   | 377   |     |      |

Tin easily melts when heated by two flames placed close together; and lead with three flames close together, when they burn long.

It hence appears that the expansions of any metal are in a less degree than the number of flames; so two flames give less than a double expansion, three flames less than a triple expansion, and so on, always more and more below the ratio of the number of flames. And the flames placed together cause a greater expansion, than with an interval between them.

For the construction of Muschenbroek's pyrometer, with alterations and improvements upon it by Desaguliers, see Desag. Exper. Philos. vol. 1. pa. 421; see also Muschenbroek's translation of the Experiments of the Academy del Cimento, printed at Leyden in 1731; and for a pyrometer of a new construction, by which the expansions of metals in boiling fluids may be examined and compared with Fahrenheit's thermometer, see Muschenb. Introd. ad. Philos. Nat. 4to, 1762, vol. 2, pa. 610.

But as it has been observed, that Muschenbroek's pyrometer was liable to some objections, these have been removed in a good measure by Ellicott, who has given a description of his improved pyrometer in the Philos. Trans. numb. 443; and the same may be seen in the Abridg. vol. 8, pa. 464. This instrument measures the expansions to the 7200th part of an inch; and by means of it, Mr. Ellicott found, upon a medium, that the expansions of bars of different metals, as nearly of the same dimensions as possible, by the same degree of heat, were as below:

Gold, Silver, Brass, Copper, Iron, Steel, Lead.  
73 103 95 89 60 56 149

The great difference between the expansions of iron and brass, has been applied with good success to remove the irregularities in pendulums arising from heat. Philos. Trans. vol. 47, pa. 485.

Mr. Graham used to measure the minute expansions of metal bars, by advancing the point of a micrometer-screw, till it sensibly stopped against the end of the bar to be measured. This screw, being small and very

lightly hung, was capable of agreement within the 3000 or 4000th part of an inch. And on this general principle Mr. Smeaton contrived his pyrometer, in which the measures are determined by the contact of a piece of metal with the point of a micrometer-screw. This instrument makes the expansions sensible to the 2345th part of an inch. And when it is used, both the instrument and the bar, to be measured, are immersed in a cistern of water, heated to any degree, up to boiling, by means of lamps placed under the cistern; and the water communicates the same degree of heat to the instrument and bar, and to a mercurial thermometer immersed in it, for ascertaining that degree.

With this pyrometer Mr. Smeaton made several experiments, which are arranged in a table; and he remarks, that their result agrees very well with the proportions of expansions of several metals given by Mr. Ellicott. The following table shows how much a foot in length of each metal expands by an increase of heat corresponding to 180 degrees of Fahrenheit's thermometer, or to the difference between the temperatures of freezing and boiling water, expressed in the 10000th part of an inch.

|                                                   |     |
|---------------------------------------------------|-----|
| 1. White glass barometer tube                     | 100 |
| 2. Martial regulus of antimony                    | 130 |
| 3. Blistered steel                                | 128 |
| 4. Hard steel                                     | 147 |
| 5. Iron                                           | 151 |
| 6. Bismuth                                        | 167 |
| 7. Copper, hammered                               | 204 |
| 8. Copper 8 parts, mixed with 1 part tin          | 218 |
| 9. Cast brass                                     | 225 |
| 10. Brass 16 parts, with 1 of tin                 | 229 |
| 11. Brass wire                                    | 232 |
| 12. Speculum metal                                | 232 |
| 13. Spelter solder, viz. 2 parts brass and 1 zinc | 247 |
| 14. Fine pewter                                   | 274 |
| 15. Grain tin                                     | 298 |
| 16. Soft solder, viz. lead 2 and tin 1            | 301 |
| 17. Zinc 8 parts with tin 1, a little hammered    | 323 |
| 18. Lead                                          | 344 |
| 19. Zinc or spelter                               | 353 |
| 20. Zinc, hammered half an inch per foot          | 373 |



For a farther account of this instrument, with its use, see *Philos. Trans.* vol. 48, pa. 598.

Mr. Ferguson has constructed, and described a pyrometer (*Lect. on Mechanics*, Suppl. pa. 7, 4to), which makes the expansion of metals by heat visible to the 45000th part of an inch. And another plan of a pyrometer has lately been invented by M. De Luc, in consequence of a hint suggested to him by Mr. Ramsden: for an account of which, with the principle of its construction and use, both in the comparative measure of the expansions of bodies by heat, and the measure of their absolute expansion, as well the experiments made with it, see M. De Luc's elaborate essay on pyrometry, &c. in the *Philos. Trans.* vol. 68, pa. 419—546.

Mr. Wedgwood contrived a curious pyrometer, in which he employed small cubes of dry clay; because that species of earth has the remarkable property of contracting in its bulk when submitted to the fire, and not again expanding, on suddenly exposing it to the cold air. In order to ascertain the precise degree of heat in an oven, he puts one of his clay cubes into it; and, after having acquired the temperature of the place, he immediately plunges it into cold water. Now, the size of the cube (that was exactly adjusted to half an inch square), is measured between two brass rules, the sides of which are somewhat obliquely disposed, so as to form an inclining groove into which the cube may be slid. In proportion as the bulk of the latter has been contracted by heat, it passes down deeper between the scales, on which the various degrees of temperature have been previously marked. Thus, when the division of the scale commences from the point of red heat visible in day-light, and the whole range be divided into 240 equal parts, it will be found that Swedish copper melts at 28; gold at 32; iron at from 130 to 150 degrees: above this point, the cubes could not be heated.

But M. Fourny has, however, given in the *Journal des Mines*, a paper on this subject, in which he shows, that the effect of shrinking does not result solely and invariably from the cause to which it is ascribed, and that it is far from necessarily proportionate to it. See *Repository of Arts*, No. 38. N. S.

**PYRO-MUCOUS ACID.** *Acidum pyromucosum.* Syrupous acid! The acid liquor obtained by distillation from insipid, saccharine, gunny, farinaceous mucilages. The celebrated Gren is of opinion, that it is a mixture of acetic with oxalic acid, and does not deserve to be received in the system of chemistry as a peculiar acid. See **PYRO-LIGNEOUS ACID**.

**PYROPHORUS**, in chemistry, the name by which several of the phosphori were at first denominated, and especially those of Homberg and Kunkell. See the article **PHOSPHORUS**. It is now chiefly confined to one of the simplest and least oporose of the phosphorescent compounds, and which is prepared by exposing to

heat in an iron pot three parts of alum and one part of sugar or of flour: the mixture liquefies, and is to be stirred constantly till the whole becomes grey, and easily reducible to powder while hot.

The coarse powder is put into a coated phial, so as nearly to fill it; the mouth of the phial is stopped with a small plug of clay, and is placed in a crucible, and surrounded with sand up to the neck. The crucible is heated to redness, until a blue flame appears at the mouth of the phial; when this has continued ten minutes, the crucible is removed from the fire, and the phial, when sufficiently cold, is accurately stopped. This substance inflames in atmospheric air; in a moist atmosphere, the inflammation is much more speedy, and in a dry air, it can scarcely take place. It burns also very brilliantly in oxygen gas, in nitrous gas, and in oxy muriatic acid gas; and is inflamed by the sulphuric and nitric acids.

**PYROSIS.** (*πυρσις*, from *πυρ*, to burn.) The heart-burn. A genus of disease in the class neuroses and order spasmi of Cullen; known by a burning pain in the stomach, attended with copious eructation, generally of a watery insipid fluid.

**PYROSOMA**, in natural history, a genus of the class vermes, order mollusca. Body lengthened and tubular, open at one extremity and closed at the other; scattered over with numerous soft papillæ. One species only, *P. phosphorica*; the colour of which when at rest is a pale greenish blue; but when in motion, which is performed by the alternate contraction and dilatation of the body, the whole appears in the highest degree of phosphoric lustre, passing through all the colours of a bar of red-hot iron till it becomes of what is termed a white-heat: after which it again passes into the colour of red-hot iron, and from that gradually declines into its original greenish hue. Length from three to five inches, diameter a fourth or fifth of the length. A native of the Atlantic ocean, in some parts of which it is seen in great multitudes, and irradiates the waves with its fiery brilliancy. See *Nat. Hist. Pl.* CLXIV.

**PYROSTRIA**, in botany, a genus of the class tetrandria, order monogynia. Calyx very minute, four-toothed; corol campanulate, five-cleft, with a downy throat; drupe pear-shaped, inferior, eight-striate; nuts eight, one-seeded. One species; a small tree of Mauritius.

**PYRO-TARTRITS.** Salts formed by the combination of the pyro-tartrous acid with different bases.

**PYRO-TARTROUS ACID.** *Acidum pyrotartrosum.* See **TARTAR** (Spirit of),

**PYROTECHNICAL.** *a.* (*pyrotechnique*, Fr. from *pyrotechnics*.) Engaged or skilled in fireworks.

**PYROTECHNICS.** *s.* (*πυρ* and *τεχνη*.) The art of employing fire to use or pleasure; the art of fireworks.

**PYROTECHNY.** (*πυροτεχνια*, formed from *πυρ*, fire, and *τεχνη*, art.) The art of fire, or a

science which teaches the management and application of fire in several operations.

Pyrotechny is of two kinds, military and chemical.

*Military pyrotechny* is the doctrine of artificial fireworks, and fire-arms, teaching the structure and use both of those employed in war for the attacking of fortifications, &c. as gunpowder, cannons, bombs, granadoes, carcases, mines, fuses, &c. and of those made for amusement-sake, as squibs, crackers, rockets, wheels, Chinese-fire, water-rockets, serpents, gerbs, illuminated globes, &c.

Some call pyrotechny by the name artillery; though that word is usually confined to the instruments used in war. Others choose to call it pyrobology, or rather pyroballogy, q. d. the art of missile fires, from the Greek πυρ, fire, and βαλλειν, to cast, or throw.

Wolfius has reduced pyrotechnia into a kind of mixt mathematical art: indeed it will not allow of geometrical demonstrations; but he brings it to tolerable rules and reasons; whereas, before, it had used to be treated by authors at random, and without regard to any reasons at all.

See the elements of military pyrotechny under the several instruments and operations, **CANNON, BOMB, ROCKET, GUNPOWDER, &c.**

*Chemical pyrotechny* is the art of managing and applying fire in distillations, calcinations, and other operations of chemistry.

Some reckon a third kind of pyrotechnia, viz. the art of fusing, refining, and preparing metals.

**PYRRHA.** The most celebrated of this name is a daughter of Epimetheus and Pandora, who married Deucalion, the son of Prometheus, who reigned in Thessaly. When all mankind were destroyed by a deluge, she alone with her husband escaped in a boat which Deucalion had made. When the waters had subsided, Pyrrha, with her husband, went to the oracle of Themis, where they were directed, to repair the loss of mankind, by throwing stones behind their backs. They obeyed, and the stones which Pyrrha threw were changed into women, and those of Deucalion into men. (See **DEUCALION**.)

**PYRRHICHIUS.** (Πυρρικός.) In the Greek and Latin poetry, a foot consisting of two syllables, both short; as *deus*.

Among the ancients this foot is also called *periambus*; by others *hegemonia*.

**PYRRHO**, a philosopher of Elis, disciple to Anaxarchus, and originally a painter. He was in continual suspense of judgment, he doubted of every thing, never made any conclusions, and when he had carefully examined a subject, and investigated all its parts, he concluded by still doubting its evidence. This manner of doubting in the philosopher has been called *Pyrrhonism*, and his disciples have received the appellation of *sceptics*, &c. He pretended to have acquired an uncommon dominion over opinion and passions. He flourished B. C. 304, and died at the advanced age of 90.

**PYRRHONISM.** Scepticism. See **PYRRHO**.

**PYRRHUS.** (See **NEOPTOLEMUS**.) A celebrated king of Epirus, descended from Achilles, by the side of his mother, and from Hercules by that of his father, and son of *Æacides* and *Phthia*. When his father, who had been banished from his kingdom, was carried to the court of Glautias king of Illyricum, who educated him with great tenderness, Cassander, king of Macedonia, wished to dispatch him, but Glautias not only refused to deliver him up, but even went with an army, and placed him on the throne of Epirus, though only twelve years of age. About five years after, he was expelled his throne by Neoptolemus, and applied to his brother-in-law Demetrius for assistance. He accompanied Demetrius at the battle of Ipsus, and fought there with all the prudence of an experienced general. He afterwards attempted the recovery of his throne, and was successful in the undertaking. In the subsequent years of his reign, Pyrrhus engaged in the quarrels which disturbed the peace of the Macedonian monarchy, and was meditating new conquests, when the Terentines invited him into Italy to assist them against the Romans. He gladly accepted the invitation; but his passage into Italy, across the Adriatic, proved nearly fatal to him. He lost the greatest part of his troops in a storm. At his entrance into Tarentum, B. C. 280, he began to introduce the strictest discipline among their troops, to accustom them to despise dangers. In the first battle with the Romans, he obtained the victory, through his elephants, whose bulk and uncommon appearance astonished the Romans. The number of the slain was equal on both sides, and the conqueror said that such another victory would totally ruin him. Though victorious, he sued for peace, but his offers of peace were refused. Another battle was soon after fought near Asculum, where the Romans and their enemies reciprocally claimed the victory. His fondness of novelty, however, soon determined him to quit Italy; he accordingly left a garrison at Tarentum, and crossed over to Sicily, by whose inhabitants he had been invited, where he obtained two victories over the Carthaginians, and took many of their towns. Having returned to Tarentum, he renewed hostilities with the Romans; but when his army of 80,000 men had been defeated by 20,000 of the enemy, under Curius, he left Italy with precipitation, B. C. 274, mortified by the victories which had been obtained over one of the descendants of Achilles. In Epirus he began to repair his military character, by attacking Antigonus, and he was at last restored to the throne of Macedonia. He afterwards marched against Sparta, but was obliged to retire to Argos, where, through the treachery of Aristeus, a bloody conflict ensued, during which, a woman, who saw Pyrrhus just going to kill her son, threw from the top of the house a tile, which brought the king to the ground. His head was cut off, and carried to Antigonus,



272 years B. C. Pyrrhus has been deservedly commended for his talents as a general; and not only his friends, but also his enemies, have been warm in extolling him. The Romans passed great encomiums upon him, and Pyrrhus was no less struck with their magnanimity and valour; so much so, indeed, that he exclaimed, that if he had soldiers like the Romans, or if the Romans had him for a general, he would leave no corner of the earth unseen, and no nation unconquered.

**PYRSTEIN**, a town of Bavaria, in the principality of Passau, insulated in Austria. It is 10 miles N.W. of Lintz, and 22 E. of Passau.

**PYRUS**, in botany, a genus of the class *icosandria*, order *pentagynia*. Calyx five-cleft; petals five; styles from two to five; pome inferior, from two to five-celled; seeds two in each cell.

This character will include both the *pyrus* and *sorbus* of Linnéus: and consequently the genus will comprize twenty-four species, chiefly natives of Europe, many of America, a few of Asia; seven common to our own mountains, woods, or hedges.

The cultivated species are the following:

1. *P. communis*. Pear tree. Tree lofty; branches upright; pendulous; leaves ovate, serrate; flowers corymbed, of a snow-white colour; fruit a pome. A native of our own woods. The wild pear, however, the mother of all the orchard and garden varieties, is thorny, with white or reddish, desidious, setaceous stipules; peduncles alternate: calyx clothed with a ferruginous wool.

The varieties are almost innumerable; they may be seen in the books upon gardening, but we cannot detail them in this work.

2. *P. malus*. Apple tree. Crab tree. Spreading; twigs and branches irregular and twisting, more horizontal than in the first; umbels sessile; leaves ovate-pointed, serrate; glabrous; claws of the petals shorter than the calyx; styles glabrous. Found wild in our hedges; and in this state, like the wild pear, this also is armed with thorns: it is then called crab or wilding. Like the last, its varieties are too numerous to be detailed.

3. *P. spectabilis*. Chinese apple tree. Umbels sessile; leaves oval-oblong, serrate, smooth; claws of the petals longer than the calyx, styles woolly at the base. A native of China; highly ornamented when in blossom, which takes place about the end of April or beginning of May: flowers large, of a pale-red when open and semi-open; the buds of a much deeper hue. Fruit sparingly produced, and of little value.

4. *P. prunifolia*. Siberian crab tree. Strong woody stem, sending out many side-branches, and covered with a smooth, brown bark: umbels sessile; peduncles pubescent; styles woolly at the base; leaves ovate, pointed, serrate. A native of Siberia. There are varieties in the size of the fruit.

5. *P. coronaria*. Sweet-scented crab tree. Leaves hearted, cut, serrate, angular, glabrous;

peduncles corymbed, and together, with the calyx glabrous; flowers of a fragrant odour. A native of America, where the inhabitants plant it to graft apples upon.

6. *P. cydonia*. Quince-tree. Low, crooked, distorted in its stem, covered with a brown bark, and branchy; leaves very entire; flowers solitary, large, pale-red or white; calyx spreading; serrate; fruit a pome, varying in shape in different varieties, globular, oblong, or pear-formed: flowers in May and June; a native of Austria.

7. *P. aira*. White beam-tree. Leaves roundish-ovate, cut, serrate, with parallel veins, white-downy underneath; flowers corymbed; styles from two to four. Found wild on the rocky mountains of our own country.

8. *P. aucuparia*. Mountain-service, mountain ash, quicken-tree, quick-beam, or roan-tree. Elegant in form; of slow growth; wood tough, close-grained, not very hard; bark smooth, grey; young branches purplish-brown; leaves pinnate; leaflets equal, nearly glabrous on both sides, serrate; flowers corymbed; styles three or four; fruit bright red, or scarlet, when ripe, nearly round, size of a large pea, juicy, astringent: blackbirds and thrushes so fond of it as generally to destroy it before all its beauty is fully displayed by being perfectly coloured and ripe.

9. *P. domestica*. True service, or sorb-tree. Size middling, resembling the preceding; not flowering till of great age; wood very hard; leaves pinnate; leaflets equal, villous underneath, serrate at top; flowers in panicles; fruit pear-shaped, reddish and spotted, extremely austere, and not eatable till mellowed by frost or time, when it becomes brown and very soft. A native of our own woods, and flowers in May.

There are several varieties with apple-shaped fruit, oval fruit, turbinated fruit, compressed fruit.

10. *P. hybrida*. Bastard service, or mountain ash. Tree middle-sized; leaves pinnate at the base, white-downy underneath; flowers corymbed; styles three or four: fruit as in *pyrus aucuparia*, but somewhat larger. It is perhaps only a hybrid plant from the two preceding.

The three last species form the genus *sorbus* of several writers.

The first seven kinds are raised by grafting and budding upon any sort of pear-stocks; occasionally upon quince-stocks, and sometimes upon white-thorn stocks: the first answer best for general use and for large trees; the other two for trees of a more moderate size, for dwarfs and wall trees.

The services are generally raised by seeds or layers; the first is the best method.

Pear-trees planted either against walls or in espaliers should have thirty feet allowed as their interval. These trees commonly produce their blossom-buds first at the extremity of their last year's shoots; and hence they require a peculiar mode of pruning, as the common mode would take off the part which should bear the

fruit, and produce new shoots from the same branch that would unnecessarily crowd the tree with wood. Pear-trees ought therefore to be carefully examined in summer, and have their foreright shoots taken off, by which means the fruit will not be over-shaded, and the trees will need but little winter-pruning. The several sorts of summer-pears all ripen best in espaliers, but the winter-pears require a south-east or south-west, or else an east wall.

The several sorts of *apples* are designed either for standards, or in dwarfs, or espaliers: those that are designed for standards should be grafted on crab-stocks, and those for dwarfs or espaliers, on the codling; or some other sort, which does not shoot freely.

The best season for planting out these trees is, if the soil is dry, in October; but in a wet soil, it is best to defer it till February. The distance at which they should be planted is forty feet square, that the sun and air may have room to come every way at them. And it is a very good method in large orchards, to plough and sow the ground between them, till they are grown up. Good thriving trees, of about three years grafting, are to be chosen for planting; and they should be taken from a soil as nearly as possible of the same nature with that they are to be planted into, or rather from one that is something poorer. In preparing these trees for planting, all the broken or bruised roots are to be taken off, as also all such as cross or gall one another, and all small fibres; for they seldom survive a remove. Some of the most luxuriant branches must also be taken off at the same time, and others shortened, but the head should by no means be cut off. The holes for the planting them should be made about two feet deep, and of a breadth proportioned to the extent of the root; the bottom must be made even, and the clods and lumps all broken. The tree is then to be set in the middle of the hole, and placed as upright as possible, and the earth carefully placed about its roots; and, finally, trod down about it with the feet; and if the weather be dry, every tree should have a good watering, which will fix the earth to the roots. A stake should also be fixed by the side of each tree to tie it to, that the wind may not shake it and loosen the roots. The foot of each tree should be then surrounded with turf newly cut, with the green side downwards; which will greatly help to keep the earth moist; and if the season be very dry, the waterings must be repeated at different times; but it is a very common error to water new-set trees too much; and this should be carefully avoided. The year afterwards dig in the earth about the roots, and bury the rotted turf which was laid about the root when planted, and there needs no farther care; the orchard will then thrive of itself. Dwarf standards are of the least value of all apple-trees, never producing well-tasted fruit; and therefore the worst way of managing this tree. Espaliers are commonly planted to surround the quarters of kitchen gardens. These quarters should be made as large as the garden-room will permit. The trees should be planted at six-

teen or eighteen feet asunder, if on crab-stocks, but if on paradise-stock, twelve feet will be sufficient; when these are planted in the manner above described, they should be headed to about four eyes above the graft, and they should never be of more than two years old from the grafting when planted. The summer after they are planted, a number of small stakes must be provided, of about three feet long, to drive into the ground on each side of the trees, four to each tree; and to these stakes the new shoots must be fastened as horizontally as possible. If the trees have taken kindly, probably about Michaelmas all the four eyes will have made shoots; if so, at Michaelmas, which is the right time for pruning, the two upper shoots should be cut off to four eyes each, but the undermost may be left with six or eight; but the branches should never be shortened in summer, unless on occasion of filling up some vacancy in the espalier, and then this must not be done after May. In the second year, all the shoots must be trained horizontally, except the fore-right ones, which must be displaced as fast as they are produced: at Michaelmas, the branches in the middle of the tree, or wherever there is a want of wood, must be shortened; but after this be very careful of any great lopping, or shortening of branches, but leave them at full length, training them all horizontally.

The quince-tree affords a great variety of fruit. The several sorts are easily propagated, either by layers, suckers, or cuttings, which must be planted in a moist soil. Those raised from suckers are seldom so well rooted as the others; and are subject to produce suckers again, in a greater abundance, which is not to be wished in fruit-bearing trees. The cuttings should be planted early in the autumn; and, in dry weather, must be often watered, to assist them in rooting; the second year they should be removed into the nursery, and set in rows at three feet distance, and one foot asunder in each row. In two or three years more, they will be fit to transplant where they are to stand, which should always be near a ditch, or river, or in some moist soil; where they will produce twice the quantity of fruit that they will in a dry one, and the fruit will also be much larger; but those in a drier soil are better tasted, and are earlier ripe.

The services, when in young plants, should be kept clear from weeds and watered in dry weather: they should be exposed to the open air, and the seed being sown in the spring, the plants should be transplanted about the middle of October, into a warm, light spot of ground, two feet asunder, in rows at a foot distance from each other. In winter the roots should be covered with mulch; and in this kind of nursery the plants may continue three or four years, when they should be again transplanted to the places where they are designed to remain: they succeed best in a strong, moist soil, and a warm situation.

PYTHAGORAS, in biography, one of the greatest philosophers of antiquity, was born about the forty-seventh Olympiad, or 590 years



## P Y T H A G O R A S.

before Christ. His father's principal residence was at Samos; but being a travelling merchant, his son Pythagoras was born at Sidon, in Syria; but soon returning home, our philosopher was brought up at Samos, where he was educated in a manner that was answerable to the great hopes that were conceived of him. He was called "the youth with a fine head of hair;" and from the great qualities that soon appeared in him, he was regarded as a good genius sent into the world for the benefit of mankind.

Samos, however, afforded no philosophers capable of satisfying his thirst for knowledge; and therefore, at eighteen years of age, he resolved to travel in quest of them elsewhere. The fame of Pherecydes drew him first to the island of Syros; from hence he went to Miletus, where he conversed with Thales. He then travelled to Phœnicia, and stayed some time at Sidon, the place of his birth; and from hence he passed into Egypt, where Thales and Solon had been before him.

Having spent twenty-five years in Egypt, to acquire all the learning and knowledge he could procure in that country; with the same view he travelled through Chaldea, and visited Babylon. Returning after some time, he went to Crete; and from hence to Sparta, to be instructed in the laws of Minos and Lycurgus. He then returned to Samos; which, finding under the tyranny of Polycrates, he quitted again, and visited the several countries of Greece. Passing through Peloponnesus, he stopped at Pholius, where Leo then reigned; and in his conversation with that prince, he spoke with so much eloquence and wisdom, that Leo was at once ravished and surprised.

From Peloponnesus he went into Italy, and passed some time at Heraclea and at Tarentum; but made his chief residence at Croton; where, after reforming the manners of the citizens by preaching and establishing the city by wise and prudent counsels, he opened a school, to display the treasures of wisdom and learning he possessed. It is not to be wondered that he was soon attended by a crowd of disciples, who repaired to him from different parts of Greece and Italy. He had a college in his own house, which he denominated *μαθησιον*, in which there were two classes of students, viz. *εἰσρωτοι* (who were also called *auscultantes*) and *εὐρωτοι*. The former of these were probationers, and were kept under a long examen. A silence of five years was imposed upon them; which Apuleius thinks was intended to teach them modesty and attention; but Clemens Alexandrinus thinks it was for the purpose of abstracting their minds from sensible objects, and inuring them to the pure contemplation of the Deity. The latter class of scholars were called *genuini*, *perfecti*, *mathematica*, and, by way of eminence, Pythagoreans. They alone were admitted to the knowledge of the arcana, and depths of Pythagoric discipline, and were taught the use of ciphers and hieroglyphic writings.

Clemens observes, that these orders corresponded very exactly to those among the Hebrews: for in the schools of the prophets there were two classes, viz. the sons of the prophets, who were the scholars, and the doctors or masters, who were also called *perfecti*; and among the Levites, the novices or tyros, who had their quinquennial exercises, by way of preparation. Lastly, even among the proselytes there were two orders: *exoterici*, or proselytes of the gate; and *intrinseci* or *perfecti*, proselytes of the covenant. He adds, it is highly probable that Pythagoras himself had been a proselyte of the gate, if not of the covenant. Gale endeavours to prove that Pythagoras borrowed his philosophy from that of the Jews; to this end producing the authorities of many of the fathers and ancient authors, and even pointing out the tracks and footsteps of Moses in several parts of Pythagoras's doctrine. But we believe the learned author was misled by the Christian Platonists.

The necessity of concealing their mysteries induced the Egyptians to make use of three sorts of styles, or ways of expressing their thoughts: the simple, the hieroglyphical, and the symbolical. In the simple, they spoke plainly and intelligibly, as in common conversation; in the hieroglyphical, they concealed their thoughts under certain images and characters; and in the symbolical, they explained them by short expressions, which, under a sense plain and simple, included another wholly figurative. Pythagoras borrowed these three different ways from the Egyptians in all the instructions he gave; but chiefly imitated the symbolical style, which he thought very proper to inculcate the greatest and most important truths; for a symbol, by its double sense, the proper and the figurative, teaches two things at once; and nothing pleases the mind more than the double image it represents to our view. In this manner Pythagoras delivered many excellent things concerning God, and the human soul, and a great variety of precepts, relating to the conduct of life, political as well as civil; he made also some considerable discoveries and advances in the arts and sciences. Thus, among the works ascribed to him, there are not only books of physic and books of morality, like that contained in what are called his Golden Verses, but treatises on politics and theology. All these works are lost; but the vastness of his mind appears from the wonderful things he performed. He delivered, as antiquity relates, several cities of Italy and Sicily from the yoke of slavery; he appeased seditions in others; and he softened the manners, and brought to temper the most savage and unruly spirits of several people and tyrants. Phalaris, the tyrant of Sicily, it is said, was the only one who could withstand the remonstrances of Pythagoras; and he it seems was so enraged at his discourses, that he ordered him to be put to death. But though the lectures of the philosopher could make no impression on the tyrant, yet they

were sufficient to reanimate the Sicilians, and to put them upon a bold action. In short, Phalaris was killed the same day that he had fixed for the death of the philosopher.

Pythagoras had a great veneration for marriage; and therefore himself married at Croton a daughter of one of the chief men of that city, by whom he had two sons and a daughter. One of the sons succeeded his father in the school, and became the master of Empedocles. The daughter, named Damo, was distinguished both by her learning and her virtues, and wrote an excellent commentary upon Homer. It is related, that Pythagoras had given her some of his writings, with express commands not to impart them to any but those of his own family; to which Damo was so scrupulously obedient, that even when she was reduced to extreme poverty, she refused a great sum of money for them.

From the country in which Pythagoras thus settled and gave his instructions, his society of disciples was called the Italic sect of philosophers, and their reputation continued for some ages afterwards, when the Academy and the Lycæum united to obscure and swallow up the Italic sect.

Pythagoras's disciples regarded the words of their master as the oracles of a god; his authority alone, though unsupported by reason, passed with them for reason itself; they looked upon him as the most perfect image of God among men. His house was called the temple of Ceres, and his court-yard the temple of the Muses; and when he went into towns, it was said he went thither, not to teach men, but to heal them.

Pythagoras was persecuted by bad men in the last years of his life, and some say he was killed in a tumult raised by them against him; but according to others, he died a natural death at 90 years of age, about 497 years before Christ.

Beside the high respect and veneration the world has always had for Pythagoras, on account of the excellence of his wisdom, his morality, his theology, and politics, he was renowned as learned in all the sciences, and a considerable inventor of many things in them; as arithmetic, geometry, astronomy, music, &c. In arithmetic, the common multiplication table is, to this day, still called Pythagoras's table. In geometry, it is said he invented many theorems, particularly these three:—1. Only three polygons, or regular plane figures, can fill up the space about a point; viz. the equilateral triangle, the square, and the hexagon. 2. The sum of the three angles of every triangle is equal to two right angles. 3. In any right-angled triangle the square on the longest side is equal to both the squares on the two shorter sides. For the discovery of this last theorem, some authors say, he offered to the gods a hecatomb, or a sacrifice of a hundred oxen. Plutarch, however, says it was only one ox; and even that is questioned by Cicero, as inconsistent with his doc-

trine, which forbade bloody sacrifices. The more accurate therefore say, he sacrificed an ox made of flour, or of clay, and Plutarch even doubts whether such sacrifice, whatever it was, was made for the said theorem, or for that concerning the parabola, which it was said Pythagoras also found out.

In astronomy his inventions were many and great. It is reported that he discovered or maintained the true system of the world, which places the sun in the centre, and makes all the planets revolve about him: from him it is to this day called the old, or Pythagorean system; and is the same as that which was revived by Copernicus. He first discovered that Lucifer and Hesperus were but one and the same, being the planet Venus, though formerly thought to be two different stars. The invention of the obliquity of the zodiac is likewise ascribed to him. He first gave to the world the name Kosmos, from the order and beauty of all things comprehended in it; asserting that it was made according to musical proportion; for as he held that the sun, by him and his followers termed the fiery globe of unity, was seated in the midst of the universe, and the earth and planets moving around him, so he held that the seven planets had an harmonious motion, and their distances from the sun corresponded to the musical intervals or divisions of the monochord.

Pythagoras and his followers held the transmigration of souls, making them successively occupy one body after another; on which account they abstained from flesh, and lived chiefly on vegetables.

**PYTHAGOREANS**, a sect of ancient philosophers, so denominated from their being the followers of Pythagoras of Samos. See **PYTHAGORAS**.

**PYTHAGOREAN TABLE**, the multiplication table.

**PYTHEAS**, a native of Massilia, famous for his knowledge of astronomy, mathematics, philosophy, and geography. He advanced far into the northern seas, and discovered the island of Thule, and entered the sea now called the Baltic. His discoveries in astronomy and geography were ingenious, and he was the first who established a distinction of climate by the length of days and nights. Pytheas lived, according to some, in the age of Aristotle.—2. An Athenian rhetorician, who distinguished himself by his intrigues and opposition to the measures of Demosthenes, of whom he observed, that his orations smelt of the lamp. Pytheas joined Antipater after the death of Alexander the Great.

**PYTHIA**, the priestess of Apollo at Delphi. She delivered the answers of the god, and was supposed to be suddenly inspired by the sulphureous vapours issuing from a subterraneous cavity within the temple, over which she sat bare on a three-legged stool, called a tripod. At this divine inspiration, her eyes suddenly sparkled, her hair stood on end, and a shivering ran over all her body. In this convulsive state she spoke the oracles with lowd howlings, &c. The Pythia, before she placed herself on the tripod,



## P Y T

used to wash her whole body, and particularly her hair, in the waters of the fountain Castalis, at the foot of mount Parnassus. The Pythia appeared dressed in the garments of virgins to intimate their purity, and they were bound to observe the strictest laws of chastity. There was originally but one Pythia, besides subordinate priests, and afterwards two were chosen and sometimes more. The most celebrated of all these is Phemonoe, who is supposed by some to have been the first who gave oracles at Delphi. The oracles were always delivered in hexameter verses, a custom which was some time after discontinued. (See DELPHI ORACULUM.)

**PYTHIAN GAMES.** Games celebrated in honour of Apollo, near the temple of Delphi. They were first instituted, according to the more received opinion, by Apollo himself, in commemoration of the victory which he had obtained over the serpent Python, from which they received the name. Some say they were established by Agamemnon, or by Diomedes, or the council of the Amphictyons, B. C. 1263. They were originally celebrated once in nine years, but afterwards every fifth year. The Romans, according to some, intro-

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duced them into their city, and called them Apollinares ludi.

**PYTHON**, a native of Byzantium in the age of Philip of Macedonia. He was a great favourite of the monarch, who sent him to Thebes, when that city, at the instigation of Demosthenes, was going to take up arms against Philip.—2. A celebrated serpent sprung from the mud, which remained on the earth after the deluge of Deucalion. Some suppose it produced by Juno, and sent by the goddess to persecute Latona, then pregnant by Jupiter. (See LATONA.) Apollo, as soon as born, attacked the monster, and killed him with his arrows, and in commemoration of the victory he instituted the celebrated Pythian games.

**PYTHONICE**, an Athenian prostitute greatly honoured by Harbalus, whom Alexander sometime before had intrusted with the treasures of Babylon. He married her, and according to some, she died the very moment that the nuptials were going to be celebrated.

**PYÜRIA.** (from *πύον*, pus, and *ούρος*, urine.) Purulent urine.

**PYX.** *s.* (*pyxis*, Latin.) The box in which the Romanists keep the host.

END OF THE NINTH VOLUME.

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